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Environmental Assessment

Flank Vegetation and Fuels Management Project

Bend-Ft. Rock Ranger District, Deschutes National Forest

Deschutes County, Oregon

Legal Description: Township (T) 20 South (S) Range (R) 13 East (E) sections 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 34, 35, and 36 as well as Township (T) 20 South (S) Range (R) 14 East (E) sections 19, 29, 30, 31, and 32, Willamette Meridian

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List of Acronyms

BA	Basal Area
BCC	Birds of Conservation Concern
BPS	Biophysical Pathways
CC	Condition Class
CWM	Coarse Woody Material
DMI	Dwarf Mistletoe Intensity
DMR	Dwarf Mistletoe Rating
EFR	East Fort Rock (OHV Area)
FVS	Forest Vegetation Simulator
GNN	Gradient Nearest Neighbor
GTR	Green Tree Retention Area
HRV	Historic Range of Variability
LOS	Late Old Structure
LRMP	Land and Resource Management Plan
MIS	Management Indicator Species
MPP	Maximum Population Potential
OGMA	Old Growth Management Area
OHV	Off Highway Vehicle
PAG	Plant Association Group
PDCs	Project Design Criteria
PI	Photo Interpretation
PPRFFA	Past, Present and Reasonably Foreseeable Future Actions
SDI	Stand Density Index
TES	Threatened, Endangered, and Sensitive Species
USFS	United States Forest Service
UMZ	Upper Management Zone
WLTL	Wildlife Tree and Log Implementation Plan

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into five parts:

Purpose and Need: The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Comparison of Alternatives, including the Proposed Action: This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives are based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Environmental Consequences: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the no action alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.

Agencies and Persons Consulted: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Appendices: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record at the Bend Fort Rock Ranger District Office in Bend, Oregon.

A combination of numerical structure levels and font/style choices are used to organize this document.

Introduction

The project is located about 17 miles southeast of Bend, two miles south of Horse Ridge and just south of China Hat Road (18). The legal description of the area is T20S R13E Sections 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 34, 35, and 36 and T20S R14E Sections 19, 29, 30, 31, and 32. The project is located in the Lower Dry River and Upper Dry River 5th field watersheds and the following 6th field watersheds: Hunter, Horse Ridge, and Tepee Draw (figure 1.1 shows the project vicinity).

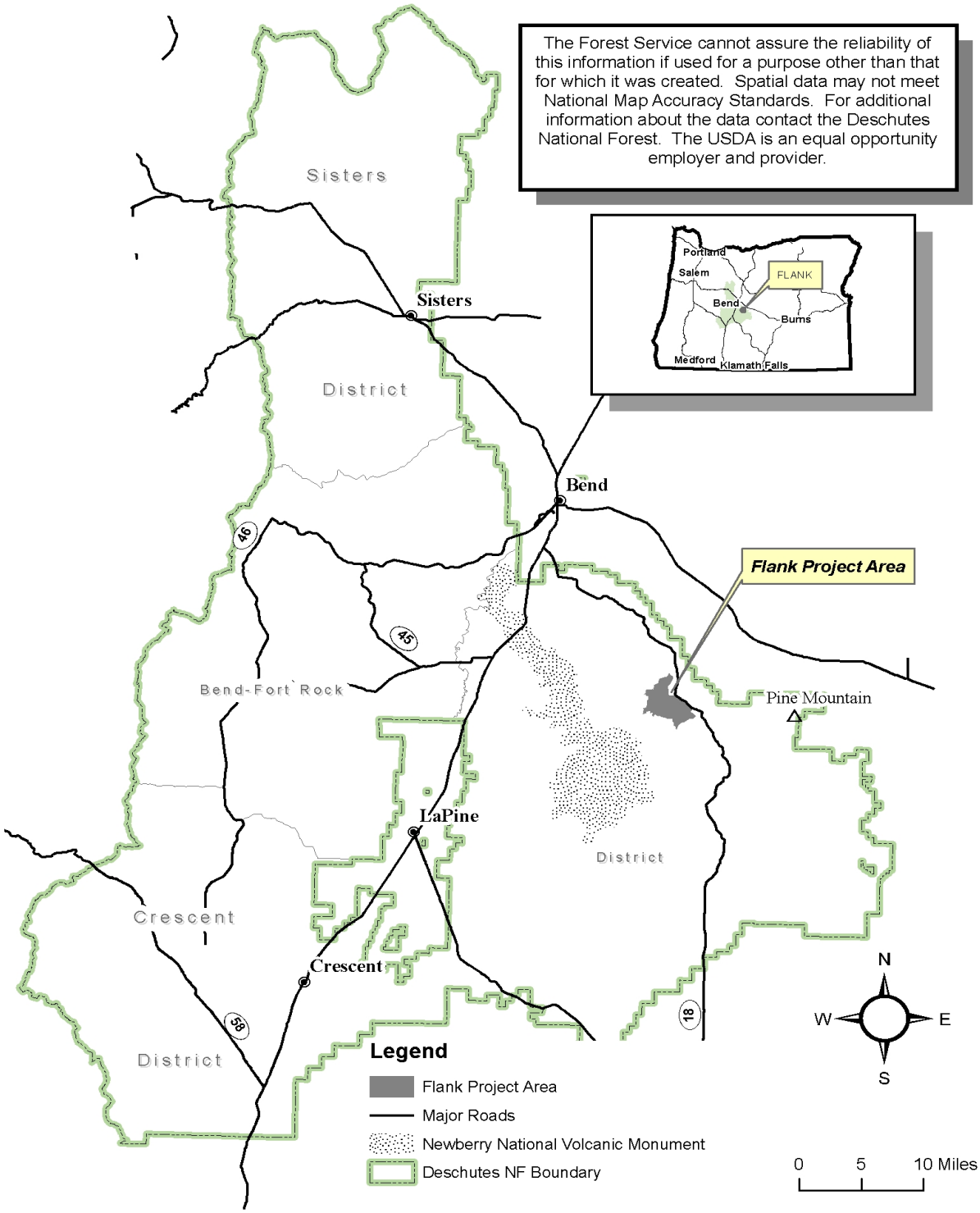


Figure 1.1 Vicinity Map

Chapter 1

1.1 Purpose and Need for Action

There is a need for this project to:

1.1.1 Improve resiliency to large-scale disturbance events such as insect, disease, and wildfire and move watersheds toward historic conditions by reducing forest vegetation density and addressing tree species composition.

There have been several large fires in the vicinity of the Flank planning area including Skeleton, Evans West, and Paulina fires. These fires have resulted in stand replacement events. There are instances of success where thinned stands have successfully withstood these fires. Bark beetle mortality is currently high on the district. Thinned stands are more resilient to attack and show better survival rates than unthinned, overstocked stands. Thinning stands in the Flank planning area would reduce the likelihood of major losses from wildfire and bark beetle attack.

Historically the area was dominated by large, open ponderosa pine stands. Decades of fire suppression and harvest practices have affected current stand conditions. Currently stands are dominated by densely stocked 80-year old blackbark ponderosa pine. There are no stands or pockets of late old structure (LOS) or old growth management areas (OGMAs) in the planning area. These uniform stands lack structural diversity and are experiencing slow annual growth making them susceptible to bark beetle attack and uncharacteristically intense stand replacement fires. Treatments in the Flank project area would begin to move stands toward the historic range of variability (Forest Plan Amendment #2, 1995 "Eastside Screens"). Timber management in MA-7 is generally appropriate when required to …maintain tree vigor for resistance to stand-threatening insect damage, or encourage desired forage in deficient areas (M7-3, page 4-113 LRMP).

1.1.2 Contribute forest products, including commercial and small tree material, to provide job opportunities for local and regional economies.

This project is located mostly in General Forest (Management Area 8) and Deer Habitat (Management Area 7). Direction to manage these allocations comes from the Deschutes National Forest Land and Resource Management Plan (LRMP), as amended. Forest wide standards and guidelines provide overarching direction for managing these areas. There is a need to manage the project area to provide an optimum level of timber production consistent with various resource objectives, environmental constraints, and economic efficiency (LRMP 4-2). The Land and Resource Management Plan states that, "no area would be devoted solely to the production of timber for use as a commodity" (LRMP4-4). Long term goals, 2040 and beyond, the forest would be fully regulated, which means that it produces, "an approximately equal annual yield of desired timber size and quality" (LRMP 4-5). In management area 7, the primary goal is to provide optimum habitat conditions for deer winter and transition ranges, however some domestic livestock forage, wood products, visual quality and recreation opportunities should be provided.

1.2 Proposed Action

The following activities are associated with this project:

1.2.1 Treat most of the 5824 acres with commercial and small-tree thinning

Many of the stands in this area were initially harvested in the 1920's and 1930's and again in the 1970's and 1980's. Commercial thinning could include products such as commercial firewood sales, post and pole sales, and traditional saw log material. Small tree thinning would be utilized where material is not economically viable. Opportunities for small tree harvest could include selling material for biomass, and

or personal use firewood. Treatments would move as large a percentage of the area as possible into the desired condition while meeting the requirements of the Deschutes Land and Resource Management Plan. By thinning proposed activities would promote large, open forest structure which would be more similar to historic conditions than the current stand structure.

1.2.2 Conduct salvage and overstory removal

Some stands have a large component of dead or mistletoe infected standing material in the overstory. Overstory removal would occur in some stands where overstory trees rich with mistletoe are infecting a fully stocked understory. Removal of this overstory component would have the added benefit of releasing the suppressed understory trees to improve growth rates and resistance to future bark beetle attacks. Stands with a high component of standing dead material may be treated with salvage harvests. By removing overstory lodgepole pine the species mix in ponderosa pine plant associations would more accurately reflect historic conditions. In ponderosa-lodgepole ecotones, post treatment stand would support a predominantly ponderosa pine overstory with an understory of young or transient lodgepole pine.

1.2.3 Perform road maintenance and reconstruction activities on all haul routes

Maintenance and reconstruction needs vary by road, but include such things as brushing, reconditioning of roadways and ditches, replacing culverts, hazard tree management, and cut slope repair. Road work would help provide for user and public safety and meets the Forest Plan objectives. If there are roads that are no longer needed for fire suppression, recreation use or timber management in the project area, these roads would be considered for closure or decommissioning.

1.2.4 Reduce fuel loadings to reduce hazards related to stand replacement wildfire events using appropriate fuels treatments.

Treatment options may include machine piling and burning, mowing of shrubs, hand piling, underburning and or yarding material to landings and burning or utilizing it there. Fuel loading in much of this area exceeds Forest Plan Standards and Guidelines. Treatment would include removal of dead downed material to bring fuel loadings to levels that comply with the Forest Plan while still maintaining required snags and downed woody debris. By reducing fuels and introducing fire this area would more accurately reflect historic conditions.

Summary of Proposed Action Activities

1. Commercial thinning of about 5341 acres of managed stands, which would result in the removal of about 14.5 MMBF of merchantable timber.
2. Salvage dead standing and downed material to meet Forest Plan Standards and Guidelines for fuel loading.
3. Treat existing fuels to meet Forest Plan Standards and Guidelines. Fuel treatment would occur after harvest and would reduce slash generated by logging operations to levels within Forest Plan Standards and Guidelines. Techniques used would include ladder fuel reduction (LFR), lopping and scattering limbs (LOP), machine shrub treatment (MST), hand piling (HP), machine piling (MP) and underburning (UB). Descriptions of these treatments can be found in table 1.1.
4. Post harvest treatment would include reforestation in stands with low stocking levels and gaps larger than 5 acres. Post harvest reforestation requirements for stands with less than 100 trees per acre or a stand density index (SDI) of 35 or lower are laid out by the Deschutes National Forest Minimum Stocking Guidelines (1991). The Deschutes Forest Plan (TM-16) allows for openings of between ½ and 6 acres in size. Precommercial thinning (for silvicultural purposes) and ladder fuel reduction (for fuels purposes) would also be conducted in order to thin trees less

than 7 inches in diameter so they can grow beyond the stand initiation stage without becoming suppressed or stressed for resources by adjacent trees. Ladder fuel reduction treatments are designed to reduce ladder fuels, thus reducing the potential for crown fire initiation.

5. Road maintenance and reconstruction activities on about 70 miles of existing Forest System roads. This includes primary access roads, arterial access roads, collector roads and local access roads. Maintenance and reconstruction needs vary by road, but include such things as improving surfacing, grading, cleaning and restoring drainage, and spot surfacing. Road work would help provide for user and public safety and meets the Forest Plan objectives.
6. Harvest systems for this project would be completely ground based as slopes do not exceed 30% in any large, continuous portion of the project area.
7. A total of 13.5 miles of temporary spur roads would be reopened from existing roadbeds or newly constructed to access harvest units. After harvest activities are completed, temporary roads would be decommissioned by ripping, water-barring, and re-establishing drainage after harvest activities to minimize soil erosion and maintain water quality.

Description of Treatments

Harvest Commercial Thin (HTH)

Commercial thinning is conducted in stands where trees over 7 inches diameter are stocked at a level where they are susceptible to bark beetle outbreaks. Commercial thinning is also used to decrease the continuity of crowns to reduce the chances of mistletoe propagation and continuity of crown fires. The project area is not yet at a point where crown fires are a concern but if left untreated, this could quickly become a factor.

Commercial thinning in the Flank project would be a thinning from below which favors the largest healthy ponderosa pine. In the Flank project the level of trees left within thinning treatments is in a range from 20 to 60 square feet of basal area. The lower basal area would be used in patches of stands where stabilization of dwarf mistletoe infection levels is desired within a stand or where managing for fire and bark beetle resistance removes lodgepole pine from within ponderosa pine stands. About 90% of the area is composed of blackbark stands. By leaving the largest, healthy trees, large tree structure and healthy stands would eventually dominate similar to the historic stand structure composition (HRV).

Mechanical harvest and accumulation would likely be accomplished using a ground-based machine equipped with a felling head (harvester shear). Felled trees would be accumulated along the main skid trail networks by the feller/buncher and then whole-tree yarded to landings using grapple skidders. Skidding equipment would be restricted to designated skid trails at all times Machine traffic off of designated logging facilities would be limited in extent.

Harvest Overstory Removal (HOR)

Harvest removal of an overstory is conducted on stands which are intended to be single story but which have an established understory of saplings or seedlings, and still retain an overstory. In the Flank project it is planned to use overstory removal in stands dominated by lodgepole pine which are stocked in the understory with seedlings and saplings. The overstory removal is also planned to remove the seed trees remaining in past shelterwood or seed tree harvests which are stocked with seedlings or saplings. Typically in these stands the remaining overstory is infected with mistletoe.

Harvest Salvage (HSV)

Harvest removal of standing and down firm wood lodgepole pine in excess of wildlife and soil productivity standards. This would be conducted where the dead lodgepole pine has been killed by mountain pine beetle and the accumulated fuels are above Forest Plan Standards and Guidelines for managing the stand resistance to wildfire mortality.

Precommercial Thin (PCT)

Precommercial thinning is used in two different situations. One is in regeneration stands which are now stocked with saplings. The second situation is in stands where there is an overstory and an understory which competes with the overstory, acts as ladder fuels and stocks openings in the overstory crown cover. Precommercial thinning in the Flank area would be used in both these situations. Within plantations which were planted or naturally seeded in two to three decades ago the stocking of the trees is at a level where there is inter-tree competition which is causing reduced growth and self pruning of lower branches. These stands also would not likely survive a light underburn or wild fire due to the tree densities and arrangement of other fuels including brush. Thinning in these stands would leave trees on 16 to 25 foot spacing in order to increase growth and followed with fuels treatments increase the chance of surviving fires.

In the Flank project precommercial thinning would also be used to manage the understory in stands which have multi canopy characteristics. This thinning leaving the biggest tree which is not in competition or acting as ladder fuels into the crown would be left on 20 to 30 foot spacing. Where underburning is planned, burning may occur before the thinning to reduce the chance of killing desired trees which were left. Instead, trees not killed by underburning would be thinned thus leaving the areas needing a few trees stocked.

Whip Falling (WHIP)

Whip falling is used in commercially thinned units to remove the non merchantable trees left which are not desired due to disease or poor condition including small crowns, bole damage or very poor growth.

Harvest Activities

Within stands where the slope is less than 30% commercial harvest would include cutting of trees with mechanical tracked harvester and removed with ground based logging systems. Within stands where the slope is more than 30% and the slope is longer than 100 feet commercial harvest would not be conducted. Landings where logs are delimbed and sorted would be needed at a rate of one acre per ten to fifteen acres. Whole tree yarding would occur and down dead firm wood lodgepole would be removed. Average skid trails would be located 100 feet apart.

Logging systems would include temporary roads. Temporary roads are roads used to access further reaches of timber sale units to extract timber more efficiently. Temporary roads are built to low specification, just enough to get equipment into landings and are obliterated at the end of the timber sale activity.

These activities would most likely be implemented in fiscal years 2011-2015. Figures 2.1, 2.2 2.3 and 2.4 along with table 2.1 show unit specific information for alternative 2. Figures 2.5, 2.6 and 2.7 along with table 2.2 show unit specific information for alternative 3.

Table 1.1 Fuels Treatment Descriptions

Treatment	Description of Treatment
Underburning (UB)	Underburning consists of burning natural fuels and activity produced fuels located in timbered stands. Slash is ignited under predetermined weather conditions in order to minimize tree mortality of residual stands. Underburning can occur as a sole treatment and in combination with other treatments developed to meet fuel reduction objectives.
Mechanical Shrub Treatment (MST)	Mechanical shrub treatment consists of mowing brush in and around ponderosa pine stands. On flatter ground a rubber tired tractor equipped with a rotary mower would be utilized for MST treatments. Slopes over 20% would require a light tracked machine with a front mounted mow deck in order to access the steeper slopes. The targeted brush species are bitterbrush and manzanita. Brush is mowed to a height of 8" and may occur on up to 70% to 80% of the area within specified units.
Handpiling (HP)	Hand piling consists of piling natural and activity created fuels by hand. Completed pile dimensions would be approximately 6' long by 6' wide by 5' in height. The amount of piles per acre would fluctuate along with fuel loadings and are expected to occur at a rate of 18 to 24 piles per acre. Piles would be burned in the late fall or winter season when moisture levels prevent fire spreading to surrounding areas.
Machine Piling (MP)	Machine piling consists of piling natural fuels and activity created fuels utilizing a Grapple Machine. Pretreatment fuel loading would generally be greater than 16 tons per acre where machine piling occurs and completed pile dimensions would be approximately 12' long by 12' wide by 8' in height and would occur at a rate of 6 to 10 piles per acre. Piles would be burned in the late fall or winter season when moisture levels prevent fire spreading to surrounding areas. Additional grapple piling would be limited to operate from skid trails used for yarding. Machine piles in these units would be located on skid trails or landing areas already detrimentally compacted or mixed by the yarding and processing operations.
Ladder Fuel Reduction (LFR)	Ladder fuels reduction involves mechanically cutting understory trees 7" dbh and less at a predetermined spacing. The desired residual stocking of trees under 7" dbh varies and is dependant on the overall stand density and structure. LFR treatments are designed to reduce ladder fuels, thus reducing the potential for crown fire initiation.
Lop and Scatter (LOP)	Lop and scatter typically occurs in light thinning slash where prescribed fire would be used as a final fuels treatment. Lopping consists of cutting the limbs off of thinned trees rearranging the fuel bed to 15" or less off the ground. Lopped slash located beneath residual trees would be manually scattered out from below tree canopies to ensure low fire intensities in these areas during prescribed fire operations.

1.3 Decision Framework

The Responsible Official for this proposal is the Forest Supervisor on the Deschutes National Forest. After completion of the EA, there would be a 30-day public comment period. Based on the response to this EA and the analysis disclosed in the EA, the Responsible Official would make a decision and document it in a Decision Notice that would accompany the final EA. The Responsible Official can decide to select the proposed action, an action alternative that has been considered in detail, modify an action alternative, or select the no action alternative. The Responsible Official may also identify which, if any, mitigation measures apply.

The decision regarding which combination of actions to implement would be determined by comparing how each factor of the project's purpose and need is met by each alternative and the manner in which each alternative responds to the significant issues raised and public comments received during the analysis. The alternative that provides the best mix of prospective results in regards to the purpose and need, the issues, and public comments would be selected for implementation.

1.4 Tiering and Incorporating by Reference

This EA incorporates by reference the Roads Analysis Report Forest Wide Assessment: Ochoco National Forest, Deschutes National Forest and Crooked River National Grassland (USDA, 2003); the Deschutes National Forest Land and Resource Management Plan and Record of Decision (USDA, 1990); and the Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (Eastside Screens).

The Roads Analysis Report Forest Wide Assessment: Ochoco National Forest, Deschutes National Forest and Crooked River National Grassland (USDA, 2003) provides recommendations for key roads to be maintained open for traffic and for non-key roads to be considered for closure. The analysis provides information needed to manage a road system that is safe and responsive to public desires, affordable and efficient, has minimal adverse effects on ecological functions and is balanced with available funding.

This EA is tiered to the Deschutes National Forest Land and Resource Management Plan (Forest Plan) FEIS and Record of Decision (ROD) dated (USDA, 1990), and all subsequent NEPA analysis for amendments, including the 1995 Eastside Screens Direction. The Forest Plan guides all natural resource management activities and provides standards and guidelines for the Deschutes National Forest. See Appendix B for standards and Guidelines used in the project design. Only the General Forest (MA8) and Deer Winter Range (MA7) fall inside the boundaries of proposed sale units. Figure 1.2 shows management allocations within unit boundaries. Table 1.2 shows allocations in the planning area.

This project lies east of the spotted owl range and is subject to the Forest Plan amendment known as the Eastside Screens. The Eastside Screens amendment was the result of a large-scale planning effort to determine the best approach for maintaining future options concerning wildlife habitat associated with late and old structural stages, fish habitat and old forest abundance. The Eastside Screens contain guidelines for management of timber sales in Late Old Structure (LOS) relative to the Historic Range of Variability (HRV), wildlife corridors, snags, coarse woody debris, and goshawk management. The Regional Forester has encouraged the consideration of Forest Plan amendments in cases where the proposed treatments would move landscape conditions towards HRV. Although intended as interim direction in 1995, it remains an applicable amendment to the Forest Plan.

Table 1.2 Management Area Allocations in the Planning Area

Deschutes LRMP Management Allocations	Acres in Project Area
MA8 – General Forest	4,498
MA7 – Deer Habitat	1,326
Total Acres	5,824

The above table shows all acres in the planning area. This analysis proposes to treat between 97 and 94% of the planning area.

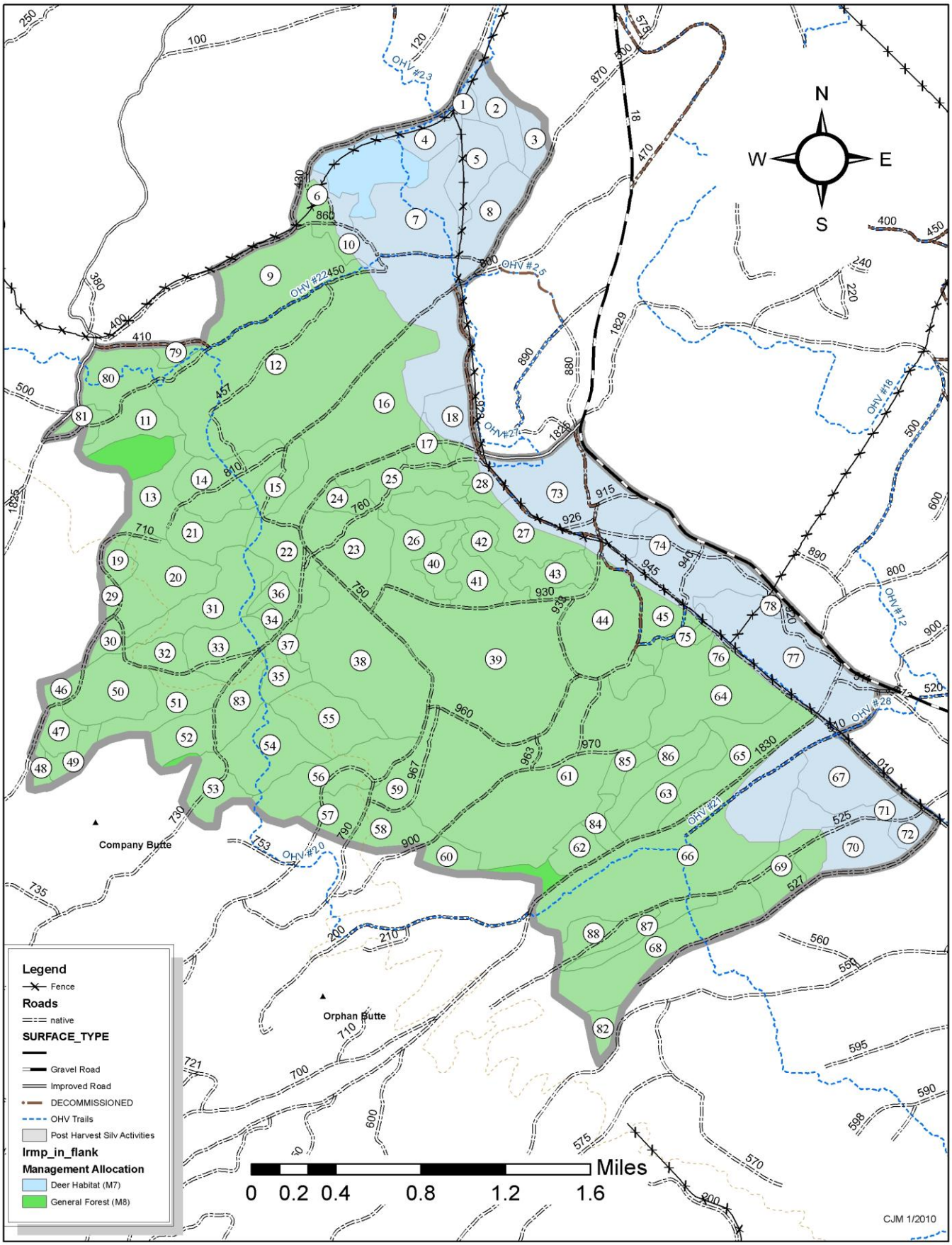


Figure 1.2 Management Allocations of Flank Project Area

1.4.1 General Forest – (MA8)

The primary goal of this management allocation is to emphasis timber production while providing forage production, visual quality, wildlife habitat and recreational opportunities for public use and enjoyment.

The objective of timber management in this area is to continue to convert unmanaged stands to managed stands with the aim of having stands in a variety of age classes with all stands utilizing the site growth potential. This is achieved through stand treatments which include (but are not limited to) controlling stocking levels; maintaining satisfactory growth rates; protecting stands from insects, disease and damage; controlling species composition; and regenerating stands that are no longer capable of optimum growth performance. Direction for silvicultural treatments is outlined in the Forest Wide Standards and Guidelines for Timber Management (TM-1 to TM- 68). These guidelines cover the requirements for silvicultural prescriptions; direction for uneven-aged management; management of advanced and natural regeneration; species preference; diversity of plant and animal communities; and horizontal, vertical, and species diversity of stands.

1.4.2 Deer Habitat – (MA7)

The primary goal of this management allocation is to manage vegetation and provide optimum habitat conditions on deer winter and transition ranges while providing some domestic livestock forage, wood products, visual quality and recreation opportunities.

The objective for vegetation in this area is to provide optimum habitat considering the inherent productivity of the land. Herbaceous vegetation would be managed to provide a vigorous forage base with a variety of forage species available. Forage conditions may be improved where conditions are poor. Foraging areas would be created where forage is lacking , maintained when in proper balance, or reduced when overabundant and more foraging areas are needed. Long term tree or shrub cover to moderate cold weather conditions is equally important. Ideally cover and forage areas should be in close proximity for optimum use by big game, with cover making up 40 percent of the land area. Approximately three-quarters of cover areas should be thermal cover with the remainder being hiding areas. Some stand conditions may satisfy both kinds of cover.

Timber management in this area is generally appropriate when required to regenerate new cover stands, maintain tree vigor for resistance to stand-threatening insect damage, or encourage desirable forage in deficient areas (M7-3, page 4-113 LRMP). Even and uneven-aged management would be applied and may include precommercial and commercial thinning. Stocking levels would be based on site specific conditions. A crown cover of greater than 40 percent with trees 30 feet high is recommended for thermal cover. Relatively low site productivity for tree-growth, coupled with recent cycles of drought, increase the risk of insect-pest epidemics killing or severely damaging tree stands valuable for cover. Thus tree canopy-cover conditions for optimal thermal protection may need to be compromised somewhat in order to moderate the risk of future catastrophic pine beetle damage. Canopy cover should be managed at the highest percentage that would maintain healthy stand conditions with a low risk of catastrophic damage due to insects or disease (M7-5, page 4-113 LRMP).

1.5 Public Involvement

The scoping letters for Flank were mailed to tribal contacts including Confederated Tribes of the Warm Springs, Burns Paiute Tribe, and the Klamath Tribes on July 22, 2009. No comments were received from the tribes. The scoping letters for Flank were mailed to all other interested parties on July 27, 2009. Comments were received from the following organizations, Cascadia Wildlands, Deschutes County, Department of Fish and Wildlife, Oregon Wild, and Oregon Chapter Sierra Club. Two individuals, Keith and Janet Nash and Gordon Baker submitted comments. Comments included feedback on topics such as overstory removal and salvage, impacts of roads and impacts to roads as a result of timber haul, gaps and untreated areas, goshawk management, and retention of trees with old growth characteristics. All correspondence and full text of letters received are in the analysis file for the Flank project at the Bend/Fort Rock Ranger District office.

The State Historic Preservation Office was consulted and their agency concurred with the findings of "No Effect" to cultural resources for the Flank project. There would be "No Effect" to fisheries resources as a result of this project. The botanical evaluation determined the project activities would have "No Impact" to proposed, endangered threatened and sensitive species. All consultation documents are available at the Bend/Fort Rock Ranger District in the project file.

The proposal has been in the Schedule of Proposed Actions (SOPA) since July 1, 2009. The Deschutes National Forest publishes the SOPA quarterly on the web and sends the document to individuals, groups and industry representatives.

Using the comments from the public and other agencies, the interdisciplinary team developed a list of key issues to be addressed in this assessment.

1.6 Issues

The Forest Service separated the issues into three groups: key, non-significant issues, and analysis issues. Key issues describe a dispute or present an unresolved conflict associated with potential environmental effects of the proposed action. Key issues are used to formulate alternatives, prescribe mitigation measures and focus the analysis of environmental effects. Key issues are tracked through issue identification (chapter 1), alternative development and description (chapter 2), and environmental consequences (chapter 3).

Non-significant issues were identified as those outside the scope of the proposed action; already decided by law, regulation, Forest Plan, or other higher level document; irrelevant to the decision to be made; or conjectural and not supported by scientific or factual evidence.

Analysis issues include other environmental components which would be considered in the effects section in chapter 3 as a way to compare the alternatives. Known as analysis issues, these items did not result in differing design elements among alternatives but are important for providing the Responsible Official with complete information about the effects of the project. Analysis issues include Forest Vegetation, Fire and Fuels, Air Quality, Wildlife, Soils, Economic Analysis, Recreation, Botanical Resources, Invasive Species, Road Engineering, and Heritage Resources.

1.6.1 Key Issue: Stand Level Structural Diversity

Measures of change: % area in explicitly created gaps, % area in naturally existing gaps, % area untreated, retention of trees with old growth characteristics, retention of existing snags.

Public comments expressed an interest in establishing diversity and complexity at the stand level by using skips and gaps to create a "gappy and clumpy" appearance. There was interest in explicitly leaving certain patches untreated for long periods of time so that large snags could be recruited at near natural levels in those areas. Some felt the scale of patches in variable density thinning regimes is important and should vary from single tree fall events to larger patches. Input included an interest in creating five acre openings across ten percent of the stands to break up stand homogeneity and create future cover patches for mule deer. Comments expressed concern with the low levels of snags currently present in the watershed and suggested elimination of salvage harvest from alternative 2.

In addition, one group suggested retaining all trees with old-growth characteristics even if they are less than 21" dbh. Because these trees have important habitat and human values and could die through natural processes providing some ecologically valuable medium and large snags and downed wood.

Response: *The Flank area has an estimated 20% of the area already serving as natural gaps and skips. Stand level treatments would result in an additional 20-25% of the area being developed into gaps and skips. With 40-45% of the project area having gaps post treatment, the areas where we need to explicitly create gaps is limited. In the 400 acre post fledgling area, alternative 3 includes explicit gap creation in several units. Alternative 3 does not include salvage harvest. Effects of excluding salvage harvest from the alternative are summarized here.*

In the short-term, lodgepole pine snags, primarily smaller diameter, would be maintained at higher levels under alternative 3 due to the lack of salvage logging. Although these snags are fairly short-term and many would fall within 10 years, while they stand they would provide habitat for species that require high snag densities. Black-backed woodpeckers (BBWO) are the most likely to benefit, although other species, such as long-legged myotis, brown creeper pygmy nuthatches, and other cavity nesting birds are also associated with high snag densities. BBWO have been observed utilizing the existing snags within the project area, and under alternative 3 known and currently used habitat would be maintained. The benefit to this species would be fairly short-term, however, as BBWO are typically only present for the first few years following heavy tree mortality before moving to a new area. Three-toed woodpeckers often utilize areas vacated by BBWO, and could utilize these snags for several additional years. Once these snags begin to fall, the levels of coarse woody material (CWM) would increase. CWM is beneficial to a variety of species, particularly small mammals which are prey for many species of raptor.

The areas proposed for salvage logging under alternative 2 have snag levels higher than the minimums required by the LRMP. However, the project level as a whole is snag deficient. Snags should not be expected to be evenly distributed across the landscape, but naturally occur in patches. Patches with densities much higher than those required by the LRMP are required by species such as BBWO.

In the long-term, snag densities would remain slightly higher under alternative 3 than 2, but this is due to fewer total acres thinned, and higher densities of trees retained on some units, not due to the lack of salvage logging under alternative 3. CWM would remain higher for longer under alternative 3.

Alternative 3 also explicitly retains trees with old growth characteristic as described by Van Pelt, 2008. These characteristics include:

- *Orange bark with plates 3 times wider than the darker fissures*
- *Few, if any, branches are present below the main crown, no noticeable knots*
- *Rounded crown, an important indicator in the Flank area, as there are quite a few trees that have been growing well since the initial logging entry. These trees are roughly 120 to 150 years old but are growing well and thus would not show domed tops and would not be left if under 21 inches unless they had other old growth characteristics.*

1.6.2 Key Issue: Goshawk Management

Measures of change: description of stand structure an density in the post fledgling area

Public comments suggested best available science indicates that goshawks are most closely associated with dense forests and there is not evidence that goshawks benefit from increased room to fly in thinned stands. Respondents favored not treating in areas near goshawk sites.

Response: *The no action alternative allows the decision maker to choose not to treat goshawk stands. Alternative 2 proposes a standard thinning regime based on stand conditions in and around goshawk sites. Alternative 3 proposes a suite of various treatments in the Post Fledgling Area (PFA), which includes 400 acres around known goshawk sites. Alternative 3 proposes to manage a northern goshawk post fledgling area (PFA) around an active nest site in a manner similar to that described in the latest paper by Youtz et al (2007). Variability within and between stands is the main objective found in the recommendations. In addition, each of the four stand prescriptions would include 10% untreated areas. These prescriptions intend to thin the stands to levels where bark beetle mortality would not develop as a common problem for more than 10 years, while still maintaining suitable goshawk habitat. A replacement nest stand in unit 54 would be left untreated under this alternative.*

1.6.3 Key Issue: Road Decommissioning and Maintenance of Existing Travel Routes

Measure of change: miles of road closed, miles of road decommissioned

Some comments encouraged road decommissioning and mentioned the Forest Service should decommission unneeded portions of roads as part of an integrated project design. Roads were mentioned as a potential source for weeds, channelizing water, and causing erosion. Members of the public expressed concerns with previous road maintenance activities in the area and with decommissioning roads after a previous sale in the area the 2015/2016 road was used for haul. Comments suggested the road was not repaired adequately or returned to its pre-logging condition. Comments suggested alternate haul routes of 23/25 route or the 18 road.

Response: *This project would not construct new system roads. The no action alternative allows the decision maker to consider no new road construction. Temporary roads located in advance of purchaser operations by Forest Service personnel would be used to minimize negative soil effects. A roads analysis was performed as part of the engineering section (3.9) in chapter 3. Maintenance and reconstruction would be performed on existing roads to allow timber haul while adhering to best management practices for water quality. This project would provide funding to improve current conditions on roughly 46 miles of road needed for rock and timber haul. All action alternatives include maintenance on roads to align them with required standards for timber haul. Road engineers working with timber sale appraisers determine most efficient and economical haul routes for timber at the time the sale contracts are written. Damage caused by purchasers hauling on forest roads must be repaired at the purchaser's expense prior to completion of the timber sale. Alternative 3 considers a plan for*

closing and decommissioning roads that are not essential to continued timber management operations. This alternative is analyzed in chapter three.

1.6.4 Non-significant Issue: reduction of future recruitment of snags and downed woody debris

Several parties expressed concern that structural and species diversity were lacking in these young second growth stands. There was concern that the project could affect snag recruitment and downed woody debris. Some comments dealt with concerns over thinning in riparian reserves.

Response: *The proposed action would meet LRMP standards for density of snags and desired downed woody debris (DWD). Silvicultural prescriptions must designate the number and size of snags, green wildlife trees, and downed logs that would meet the habitat requirements for cavity nesting and other species. Snags must provide for 100% potential population levels based on current science such as DecAID [Appendix B Amendment #2 4) a) (1)-(2)]. Deer Habitat standards and guidelines specify that snags, and the live trees needed for future snags, would be managed based on direction in the Forest-wide S&Gs. Fuel treatment and fuel wood collection policies must provide and maintain necessary deadwood habitat as described in the Forest-wide S&Gs (M7-12). Directions for managing General Forest (M8) state that slash would be treated to reduce the chances of fire starts and rates of spread to acceptable levels, but would not be cleared to the point that the forest floor is devoid of all slash and logs. Some slash and larger material would be left for ground cover for soil protection, microclimates for establishment of trees, and small mammal habitat (M8-27). Optimum fuel loadings and thus levels of downed woody debris should be guided by photo series found in "Photo Series for Quantifying Forest Residues," a cooperative publication by the Pacific Northwest Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service, Portland Oregon (M8-27). The effects of the proposal on these resources are explained in chapter three in the Vegetation (3.2), Fuels (3.3), and Wildlife sections (3.4).*

1.6.5 Non-Significant Issue: OHV trails and potential closure of roads along fence lines make maintenance difficult and dangerous

Respondents were concerned with the impacts to fence maintenance operations caused by OHV trails that parallel existing fence lines and suggested OHV trails be re-located or closed in this area. Respondents also suggested existing roads along fence lines should remain open to allow for continued maintenance of fence lines.

Response: *Removing or relocating OHV trails is outside the scope of this decision. Trails designated as part of the East Fort Rock OHV area were designated and established under a different planning document. Roads slated for decommissioning and closure were determined by an interdisciplinary process and are displayed in figure 3.9.1.*

Chapter 2. Alternatives, Including the Proposed Action

This chapter describes and compares the alternatives considered for the Flank project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

2.1 Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public concerns received in response to the proposed action expressed concerns they had with the proposal and provided suggestions for different course of action. Some of these alternatives may have duplicated the alternatives considered in detail or were determined to be unable to meet the project's purpose and need. Alternatives that were considered but not analyzed in detail are summarized below.

2.1.1 Eliminate overstory removal from the project

Some comments showed a concern with the use of overstory removal and salvage treatments. Comments encouraged reexamining silvicultural prescriptions and considering mistletoe as a natural part of the forest cycle. Overstory removal would reduce the average diameter of the stands, which is generally not consistent with moving these stands toward the historic range of variability of large trees as required by the Eastside Screens.

Overstory removal is a tool used to set lodgepole stands on a trajectory to develop single-story stands in proportions that are representative of historic conditions. Units with some component of overstory removal are shown in figure 2.1. Overstory removal on this site is used primarily to control mistletoe infections that are not representative of historic levels. Some overstory structure would be retained in units with "overstory removal" prescriptions (in some cases this would be explicitly created with green tree retention areas (GTRs).

Currently multi-story stands are infected with mistletoe caused by higher than normal stand densities. Mistletoe infestations are more widespread and intense than found historically in the landscape (Hessburg, 1994). This infected mistletoe overstory sits above a fully regenerated lodgepole pine understory. Removal of overstory trees would release the understory and improve growing conditions allowing the understory to develop into the much needed and underrepresented single-story young stands. If these overstory trees are not removed, the stands would most likely not reach old tree condition due to dwarf mistletoe infections, growth loss and mortality.

Some overstory structure would be retained in all overstory removal units, in units dominated by lodgepole pine this may include only ponderosa pine trees. In stands that have a mix of ponderosa pine and lodgepole pine, it would be only the lodgepole pine that is removed from the overstory, the ponderosa pine overstory would remain. In stands that are purely lodgepole pine (75 acres in units 53, 81, and 84) 10% of the stand would be retained for wildlife habitat and no treatment areas. Overstory trees in these stands are generally between 9 and 14 inches and serve a limited function as wildlife habitat. Mistletoe could not be eliminated from the lodgepole pine overstory by selecting only those trees with visible infections. Latent infections in the bole of the trees would eventually surface and infect the stands in the future. For this reason it is necessary to remove all overstory lodgepole pine that are not retained in reserve patches.

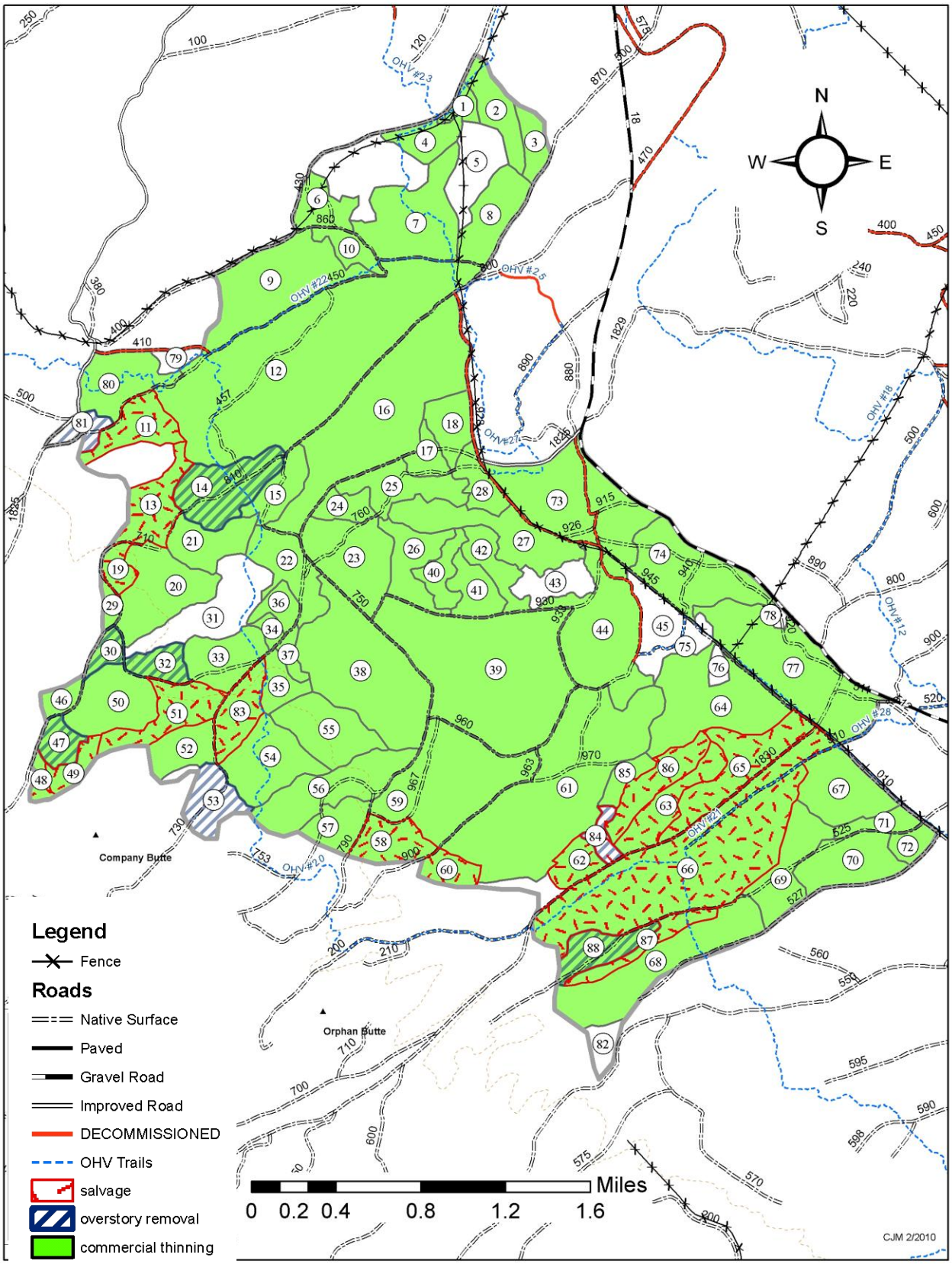


Figure 2.1 Units with Overstory Removal and or Salvage

2.2 Alternatives Considered in Detail

2.2.1 Alternative 1. No Action

In alternative 1, current management plans would continue to guide activities in the project area. None of the proposed actions would be implemented. The "No Action" alternative serves as a baseline to compare and describe the differences among action alternatives.

Timber supply objectives would be met with other areas either on the Bend/Fort Rock Ranger District or from elsewhere on the Forest. Because there are no harvest units in this alternative, no map is provided. Existing site specific management plans and Standards and Guidelines would continue to be the basis for management of the project area.

Vegetation:

31 % of stands are resistant to beetle kill mortality. No late old structure is present. In 10 years, there would be 7 trees per acre that are greater than 20 inches. This level of large trees still does not meet late old structure guidelines. The average diameter would be 8.6" for all trees. At least half the trees would not be resistant to fire at 4' flame lengths. Mistletoe intensity would limit tree growth by more than 10% in 30 years.

Fire and Fuels:

The area is mostly condition class two (71%) with only 4% in condition class 1 and 25% in condition class three. In the event of a wildfire, 6% of the area would experience Low (<4') flame lengths , less than 1% would experience moderate (4') flame lengths, and 94% of the area would experience flame lengths greater than 8 feet. Under current conditions, 90-99 percent of trees 5 to 25 inches in diameter would be killed in a wildfire event.

Wildlife:

Green Tree retention areas would be maintained in the short term. In the long term, stand replacing wildfires could eliminate sources of green trees in the project area. For snags, standards and guidelines would be met in the short term (10 years) for small diameter snags.

Large diameter snags would be slower to develop than under the action alternatives as unthinned stands leave trees in competition for water and nutrients. Large diameter snags would remain below standards and guidelines for at least 30 years.

There would be no decrease in hiding or thermal cover in summer or winter range, but without forest health treatments the risk of catastrophic wildfire would increase in the future placing cover at risk over potentially large areas of the landscape with a resulting recovery time of years if not decades (i.e. the Skeleton, Evans West, and Paulina Fires). Alternative 1 would not be moving toward the LRMP's desired road density in deer summer and winter range and would continue to exceed LRMP standards and/or guidelines.

Some habitat for Northern Goshawk would develop. Disturbance events may diminish habitat leaving only small isolated pockets of habitat that may or may not support breeding pairs and fledglings. Short term, stands would provide habitat for the sharp-shinned hawk and Cooper's hawk. Long term, stands would begin to deteriorate, new habitat development would decrease and habitat potential may ultimately decline.

In the short-term individual old growth trees that provide nest trees for red-tailed hawks would diminish due to individual mortality. In the long-term stands would be slow to mature due to over stocking, and nest trees would be incidental due to the lack of LOS that would develop. Suitable nest trees may become more sporadic on the landscape.

For woodpeckers, stand replacement fires have the potential to benefit species that use small snags in the short term. Once snags have fallen, new woodpecker habitat would be slow to develop.

Species of Concern, Birds of Conservation Concern, and land birds are discussed by habitat type. Habitat types include: Ponderosa pine; lodgepole pine; and openings, shrub lands, and meadows. For ponderosa pine, stands would remain at increasing risk of a landscape scale stand replacing fire or high levels of bark beetle attacks or both. Tree growth would be slow and LOS would be slow to develop. For lodgepole pine, stands are currently in dense, connected stands outside of the HRV. Under the no action, a larger stand-replacement fire is more likely and would leave less habitat. For openings, shrub lands and meadows, long-term, pine seedlings would continue to develop, and some of these areas may convert to forest. Alternatively, large stand-replacement events could result in even larger areas of openings, or move these shrub stands to an earlier seral stage with grasses as a potential dominant.

Habitat for bats would remain unchanged in the short term, long term late old structures would be slow to develop and potential for root trees and foraging habitat would be limited.

Soils:

Effects to soils are analyzed by detrimental soil disturbance and coarse woody debris. Detrimental soil disturbance is further broken down into: harvest effects, temporary and system roads, fuels treatments and sensitive soils.

Harvest effects would not exist under the no action alternative but effects from a wildfire event could occur if stands are not treated. Wildfires may incur localized detrimental changes to soil chemical, physical and biological properties on 5% of the burned area. No increase in detrimental soil conditions above existing levels without a wildfire event.

There would be no effect to system roads as no changes would be made to Forest Service system roads.

Without fuels treatments, productivity of the soil resource may decrease in the short term in the absence of wild or prescribed fires that provide a cyclical flush of nutrients in dry forest systems.

Sensitive soils including areas prone to frost and lacking the capability to be regenerated as well as areas with slopes exceeding 30% would not be affected as no treatment activity would occur.

Coarse woody debris and surface organic matter would increase over time from current levels at a rate dependent on mortality rates of the stands, as well as natural wind events to move snags to the ground. In the short term, the amount of coarse woody debris and surface litter are likely to increase through natural mortality, windfall, and recruitment of fallen snags over time. High-to-extreme fire hazard and potential for excessive soil heating exists when downed woody debris exceeds 30 to 40 tons per acre.

Botany:

The no action alternative provides the most protection to limit invasive species establishment. No threatened, endangered or sensitive plants are present and no high-probability habitat exists in the project area.

Range:

Vegetation and forage production would diminish over time. Canopy closure would increase and forage species would decline, reducing the availability of forbs, grasses and shrubs for browse.

Recreation:

Recreation opportunities would remain relatively unchanged. No existing OHV trails or routes, facilities, structures, or infrastructure within the EFR OHV area would be impacted by vegetation or fuel reduction activities.

Heritage Resources:

There would be no effect to heritage resources as treatment would not occur. In the event of a wildfire, unmanaged fuels would be burned yielding potentially extreme burn temperatures and possibly endangering unknown cultural resource sites and artifacts.

Obscuring vegetation does lend a certain level of protection to otherwise high visibility objects on the ground surface. In the event of a large wildfire, much of this vegetation would be removed by burning or during suppression activities such as fire line construction. Higher visibility of sensitive materials at cultural resource sites would then be more vulnerable to looting and theft, an on-going problem on public lands in Central Oregon.

The loss of surface litter from intense wildfire combined with increased hydrophobic soil conditions leads to erosion due to runoff of surface water. Erosion across sites removes artifacts and deposits sediment from uphill slopes.

2.2.2 Alternative 2 Proposed Action

Alternative 2, the proposed action, would respond to the purpose and need treating fuels and harvesting timber on 5688 acres. 276 acres (5%) of stands in the Flank area would remain untreated with this project. Additionally there may be acres within unit slated for treatment that are left untreated either by harvest or by fuels operations. These areas include unharvestable areas (some of which are wildlife retention areas), rocky areas, areas where trees are not large enough to be economically viable and special protection sites. This alternative is consistent with the Deschutes National Forest Plan. Figure 2.1 shows the units by treatment type, figure 2.2 shows proposed fuels treatments, and figure 2.3 shows proposed post-sale activities. Table 2.1 shows the specific features and types of treatment for each unit in this alternative.

This alternative would:

- Harvest roughly 14.5 MMBF while treating 5688 acres
    - Thinning would occur on 5341 acres
    - Overstory removal would occur on 251 acres
    - Salvage harvest would occur on 857 acres
- Pre-commercial thin 2531 acres
- Reutilize and close after harvest 2.8 miles of temporary road spurs
- Construct 10.7 miles of new temporary spur roads

  (roads would be closed after use)
- Maintain 21.5 miles of existing system roads
- Perform reconstruction activities on 24.6 miles of existing system roads
- Subsoil 4 miles of existing system roads
- Close 2.3 miles of existing system roads
- Decommission 4 miles of existing system roads
- Conduct ladder fuel reduction on 149 acres
- Lop and scatter on 1131 acres
- Conduct machine shrub treatment on 289 acres
- Handpile 5 acres
- Machine pile 1345 acres
- Underburn 4902 acres
- Subsoiling 19-38 acres of compacted skid trails, temporary roads and landings.

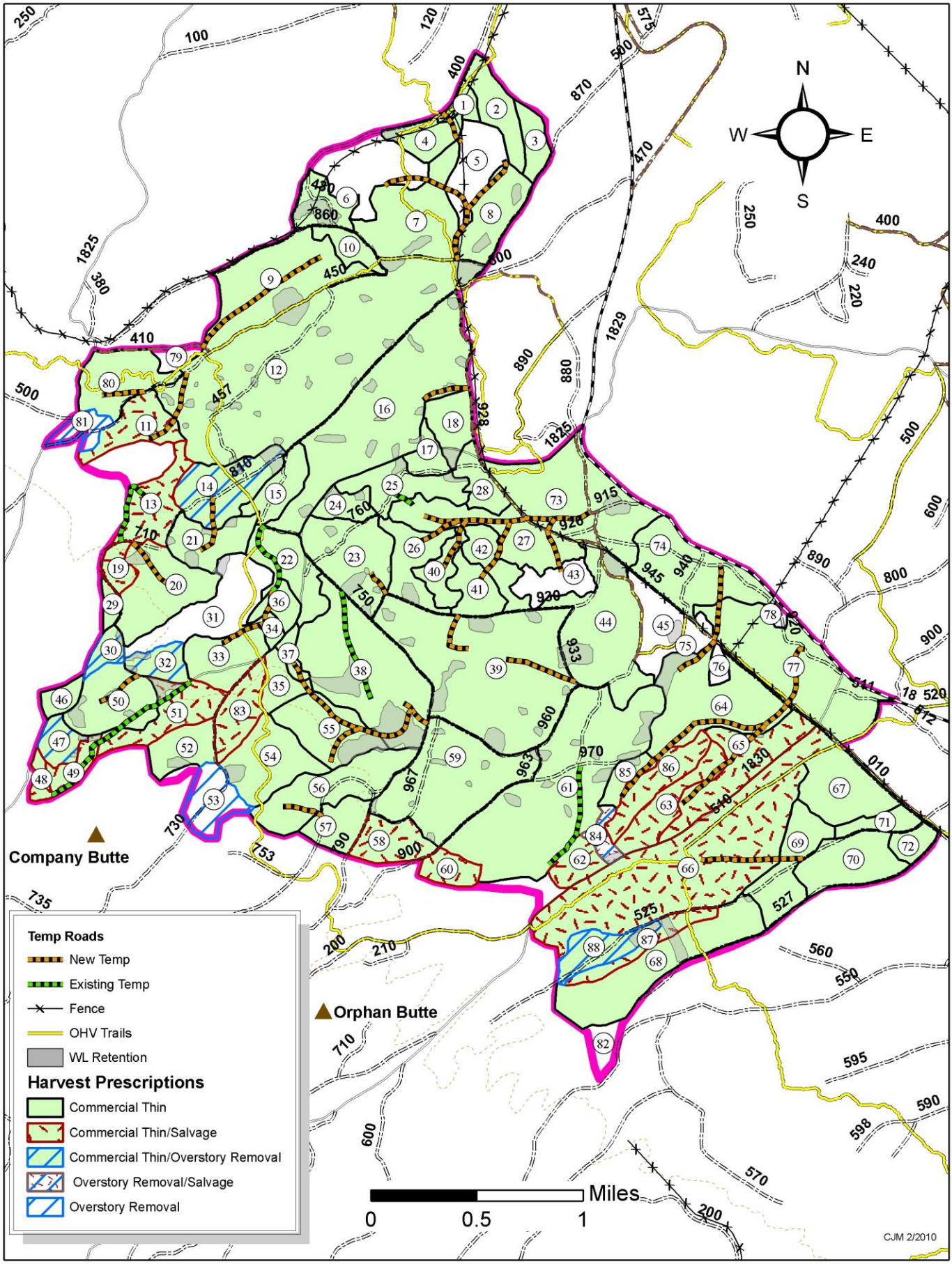


Figure 2.1 Alternative 2 Harvest Prescriptions

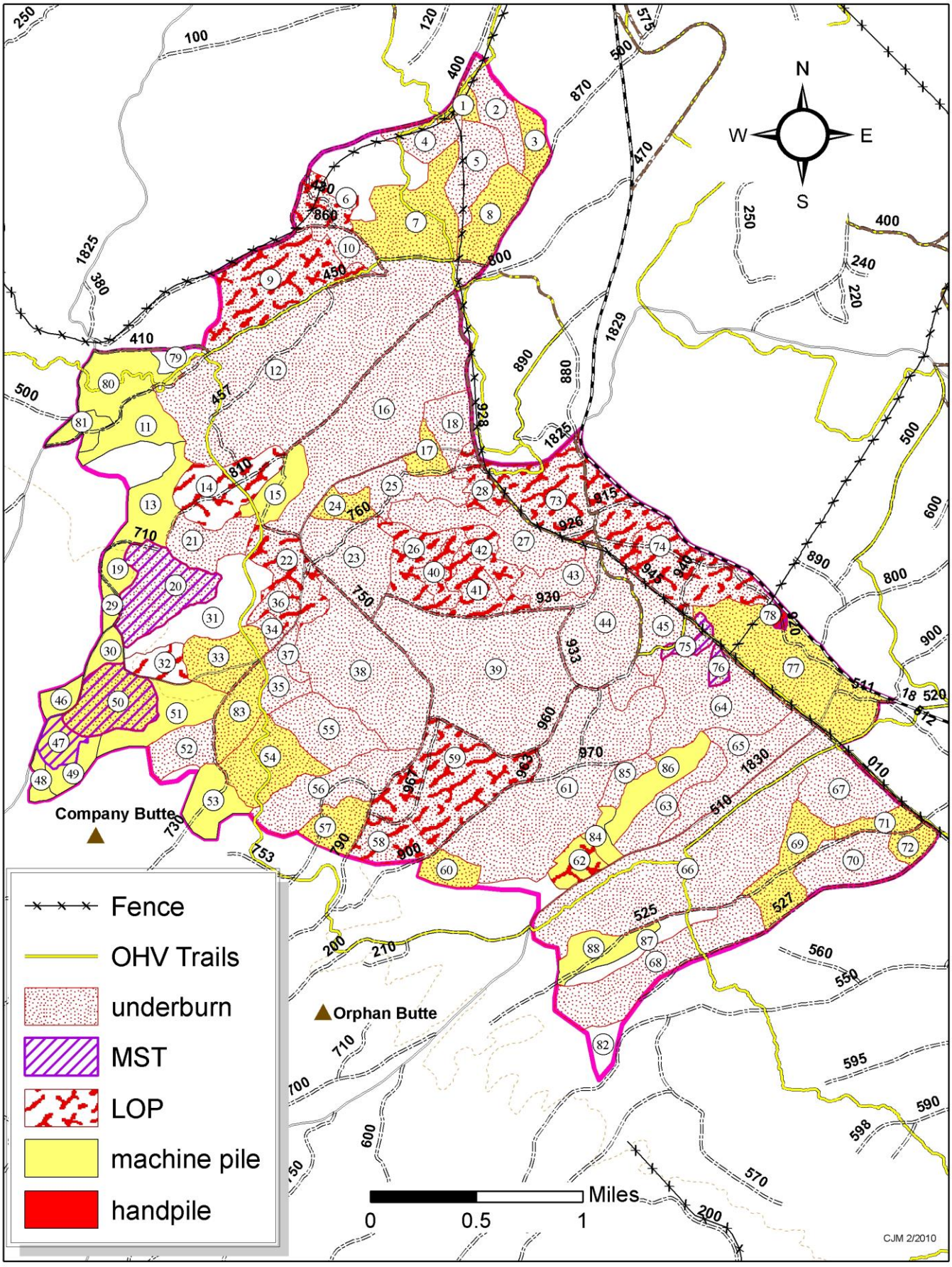


Figure 2.2 Alternative 2 Fuels Treatments

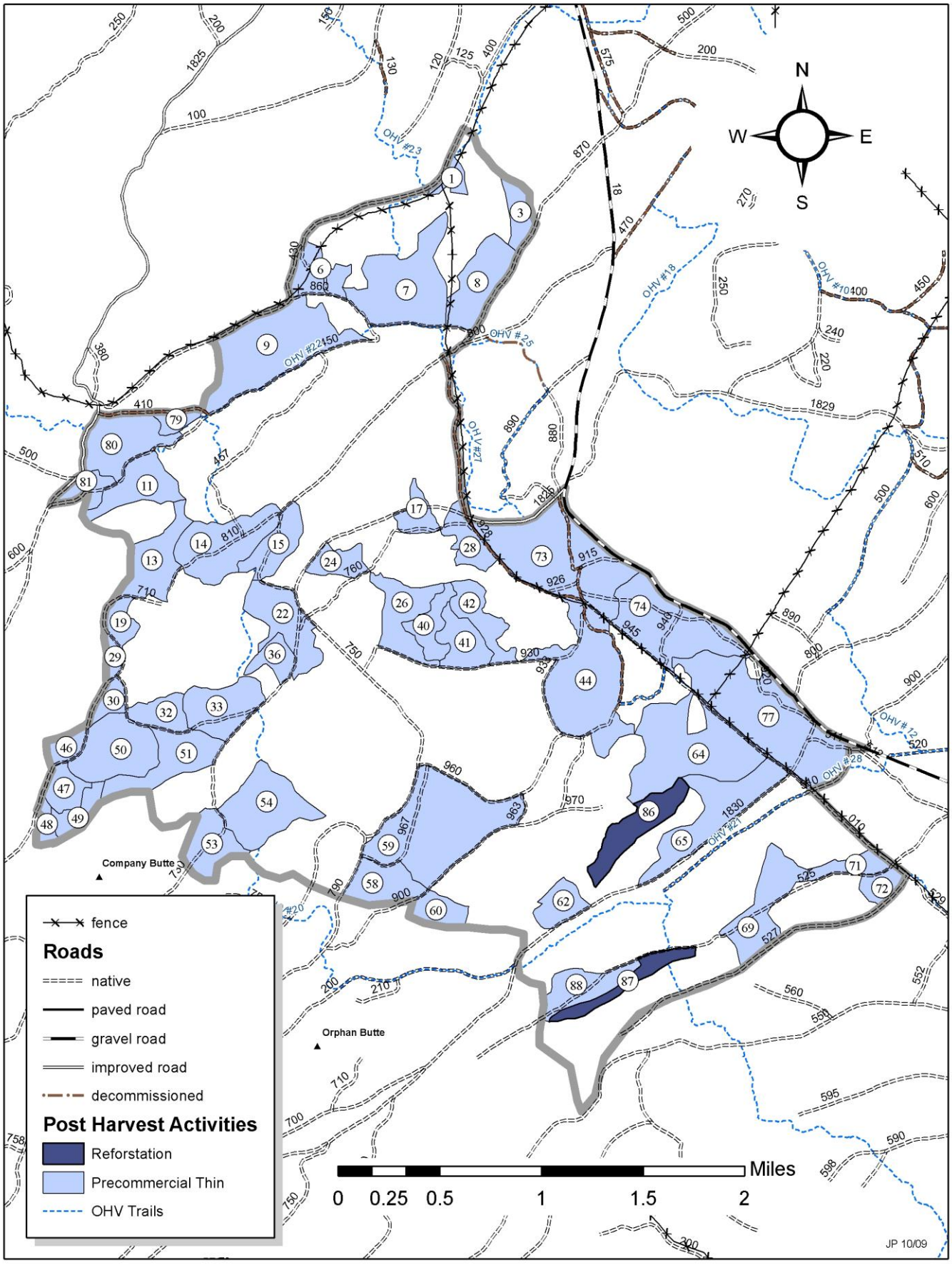


Figure 2.3 Alternative 2 Post Sale Treatments

Figure 2.4 Looking east at unit 63 from the bottom of the draw in unit 86. Both stands are slated for thinning (HTH) and salvage treatment (HSV)

Table 2.1 Alternative 2 Harvest Unit Summary

Alt 2 Unit	acres	Harvest			Post Sale Treatment			Fuels Treatments				
		HTH	HSV	HOR	PCT	LFR	REF	LFR/ LOP	MST	HP	MP	UB
1	13	y			y						y	y
2	42	y										y
3	23	y			y						y	y
4	31	y										y
5	53											y
6	35	y						y*				y
7	102	y			y						y	y
8	57	y			y						y	y
9	128	y						y*				y
10	22	y										y
11	46	y	y		y						y	
12	429	y										y
13	51	y	y		y						y	
14	73	y		y	y			y				
15	35	y			y						y	
16	233	y										y
17	20	y			y						y	y
18	36	y										y
19	17	y	y		y						y	
20	85	y							y			y
21	47	y				y		y				y
22	56	y			y			y				y

Alt 2 Unit	acres	Harvest			Post Sale Treatment			Fuels Treatments				
		HTH	HSV	HOR	PCT	LFR	REF	LFR/ LOP	MST	HP	MP	UB
23	88	y										y
24	22	y			y						y	y
25	53	y										y
26	50	y			y			y				y
27	87	y										y
28	29	y			y			y				y
29	10	y			y						y	
30	16	y		y	y						y	
31	81											
32	25	y		y	y			y				
33	53	y			y						y	y
34	9	y				y		y				y
35	25	y										y
36	20	y			y			y				y
37	12	y				y		y				y
38	178	y										y
39	281	y										y
40	27	y			y			y				y
41	34	y			y			y				y
42	35	y			y			y				y
43	34											y
44	134	y			y							y
45	47											y
46	15	y			y						y	
47	23	y		y	y				y		y	

Alt 2 Unit	acres	Harvest			Post Sale Treatment			Fuels Treatments				
		HTH	HSV	HOR	PCT	LFR	REF	LFR/ LOP	MST	HP	MP	UB
48	10	y	y		y						y	
49	20	y	y		y						y	
50	68	y			y				y		y	y
51	56	y	y		y						y	
52	38	y										y
53	41			y	y						y	
54	73	y			y						y	y
55	68	y										y
56	86	y							y			y
57	36	y									y	y
58	41	y	y down		y whip			y				y
59	152	y			y whip			y				y
60	23	y	y		y whip						y	y
61	272	y										y
62	26	y	y		y whip			y			y	
63	48	y	y									y
64	123	y			y							y
65	81	y	y		y	y		y				y
66	305	y	y									y
67	71	y										y
68	118	y										y
69	62	y			y						y	y
70	66	y										y
71	20	y			y						y	y

Alt 2 Unit	acres	Harvest			Post Sale Treatment			Fuels Treatments				
		HTH	HSV	HOR	PCT	LFR	REF	LFR/ LOP	MST	HP	MP	UB
72	18	y			y						y	y
73	149	y			y whip fall			y				y
74	102	y			y whip fall			y				y
75	13								y			y
76	9								y			y
77	164	y			y						y	y
78	5								y	y		y
79	12				y							
80	62	y			y						y	
81	19			y	y						y	
82	18											
83	42	y	y		y						y	y
84	15		y	y							y	
85	19	y										y
86	48	y	y				y Plant PP				y	
87	28	y	y				y Plant PP					
88	39	y		y							y	
sum	5688	5341	857	251	2531	149	76	1131	289	5	1345	4902

HTH – Commercial Thin
HSV – Salvage Harvest
HOR – Overstory Removal
PCT – Pre-Commercial Thin
LFR – Ladder Fuel Reduction
LOP – Lop and Scatter Material
MST– Mechanical Shrub Treatment (mowing)
HP – Handpile
MP – Machine Pile
UB – Underburn

BA – Basal Area **PICO – Lodgepole Pine**

PP – Ponderosa Pine **WHIP – Falling of small trees less than 4.5' tall**

2.2.3 Alternative 3

Alternative 3 would respond to the purpose and need by treating fuels and harvesting timber on 5343 acres. Untreated areas would occur as full stands and as small islands or clumps within stands. 136 acres (2%) of stands in the Flank area would remain untreated with this project. Additionally 10% of all blackbark stands would be left untreated as wildlife retention areas. Two stands would remain untreated in their entirety as part of the prescription for the post-fledgling area (this represents 30% of the post fledgling area). Additionally there may be acres within units slated for treatment that are left untreated either by harvest or by fuels operations. These areas include unharvestable areas (some of which are wildlife retention areas), rocky areas, areas where trees are not large enough to be economically viable and special protection sites. Across the project area this is roughly equivalent to 817 acres of untreated stands or 15% of the project area. This alternative addresses the key issues of goshawk management and road decommissioning and maintenance of existing travel routes. This alternative does not include salvage harvest. Salvage harvest was removed due to public comments that did not favor this activity. This alternative is consistent with the Deschutes National Forest Plan. Figure 2.5 shows the units by treatment type, figure 2.6 shows proposed fuels treatments, and figure 2.7 shows proposed post-sale activities. Table 2.2 shows the specific features and types of treatment for each unit in this alternative.

This alternative would:

- Harvest roughly 14.2 MMBF while treating a total of 5615 acres
    - Thinning would occur on 5268 acres
    - Overstory removal would occur on 251 acres
    - Salvage harvest would occur on 0 acres
- Pre-commercial thin 2440 acres
- Reutilize and close after harvest 2.8 miles of temporary road spurs
- Construct 10.7 miles of new temporary spur roads (roads would be closed after use)
- Maintain 21.5 miles of existing system roads
- Perform reconstruction activities on 24.6 miles of existing system roads
- Subsoil 4 miles of existing system roads to decommission
- Close 2.3 miles of existing system roads
- Conduct ladder fuel reduction on 149 acres
- Decommission 4 miles of existing system roads
- Lop and scatter on 1131 acres
- Conduct machine shrub treatment on 289 acres
- Handpile 5 acres
- Machine pile 1272 acres

- Underburn 4705 acres
- Subsoiling 19-39 acres of compacted skid trails, temporary roads and landings

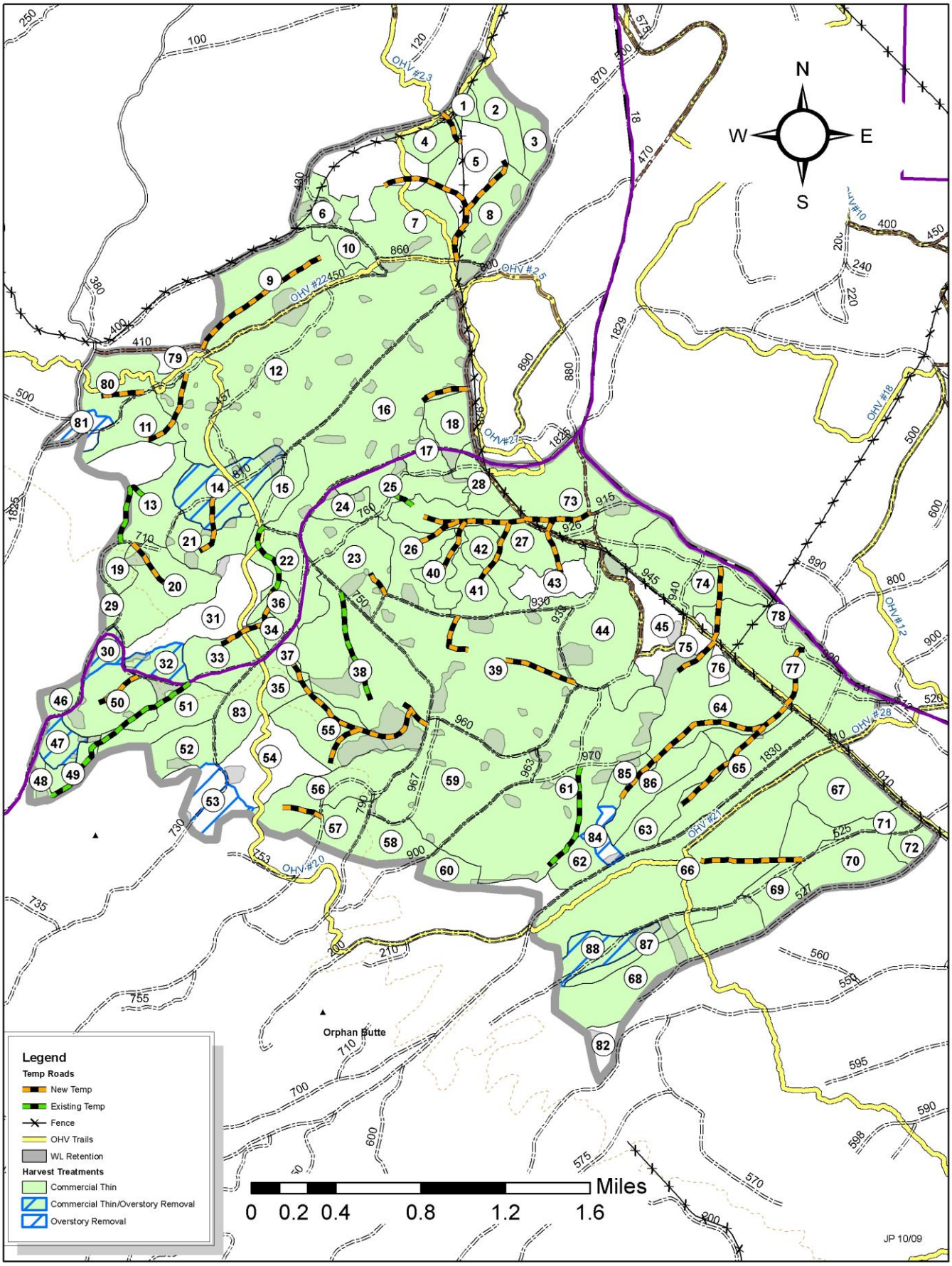


Figure 2.4 Alternative 3 Harvest Prescriptions

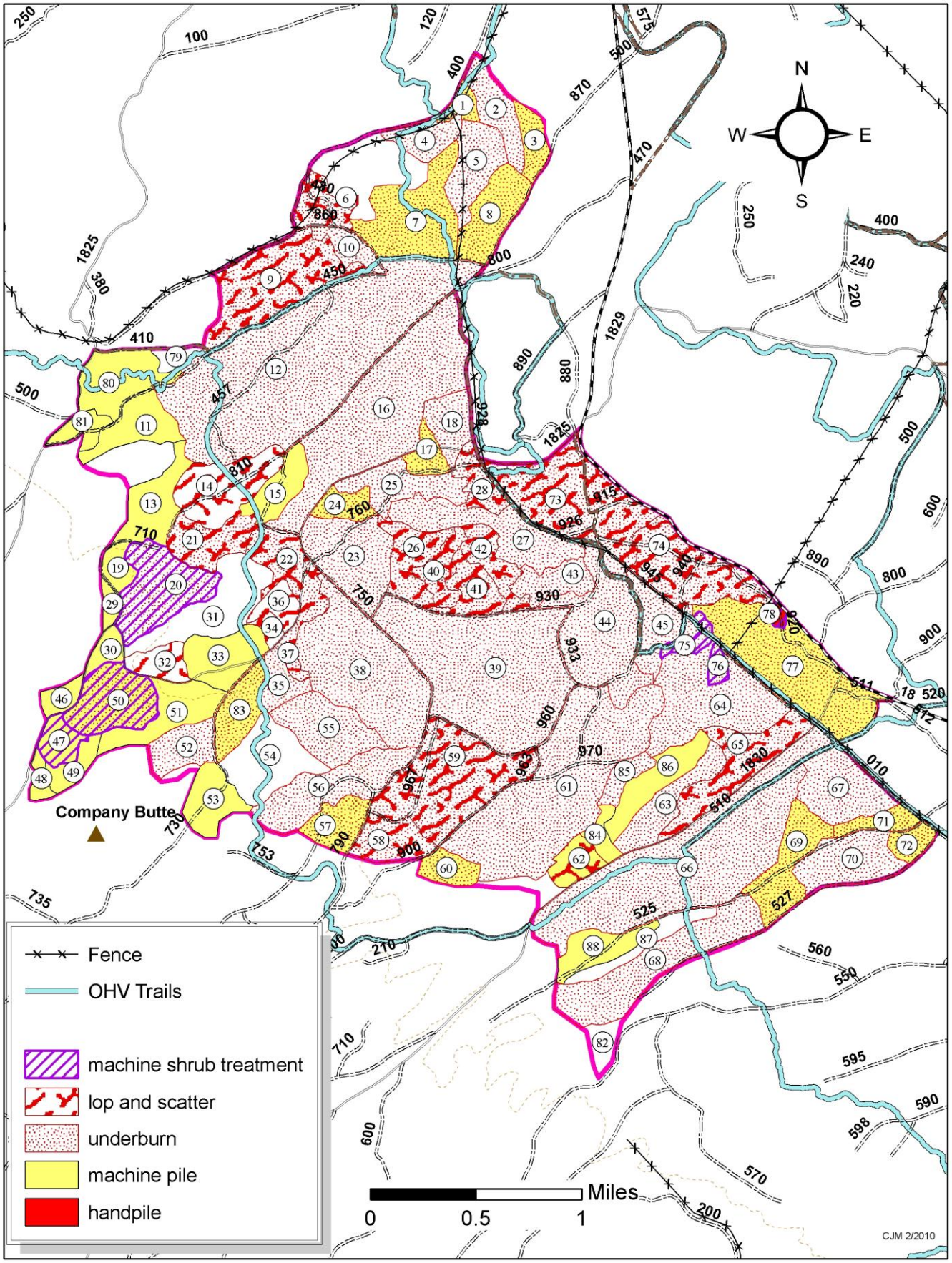


Figure 2.5 Alternative 3 Fuels Treatments

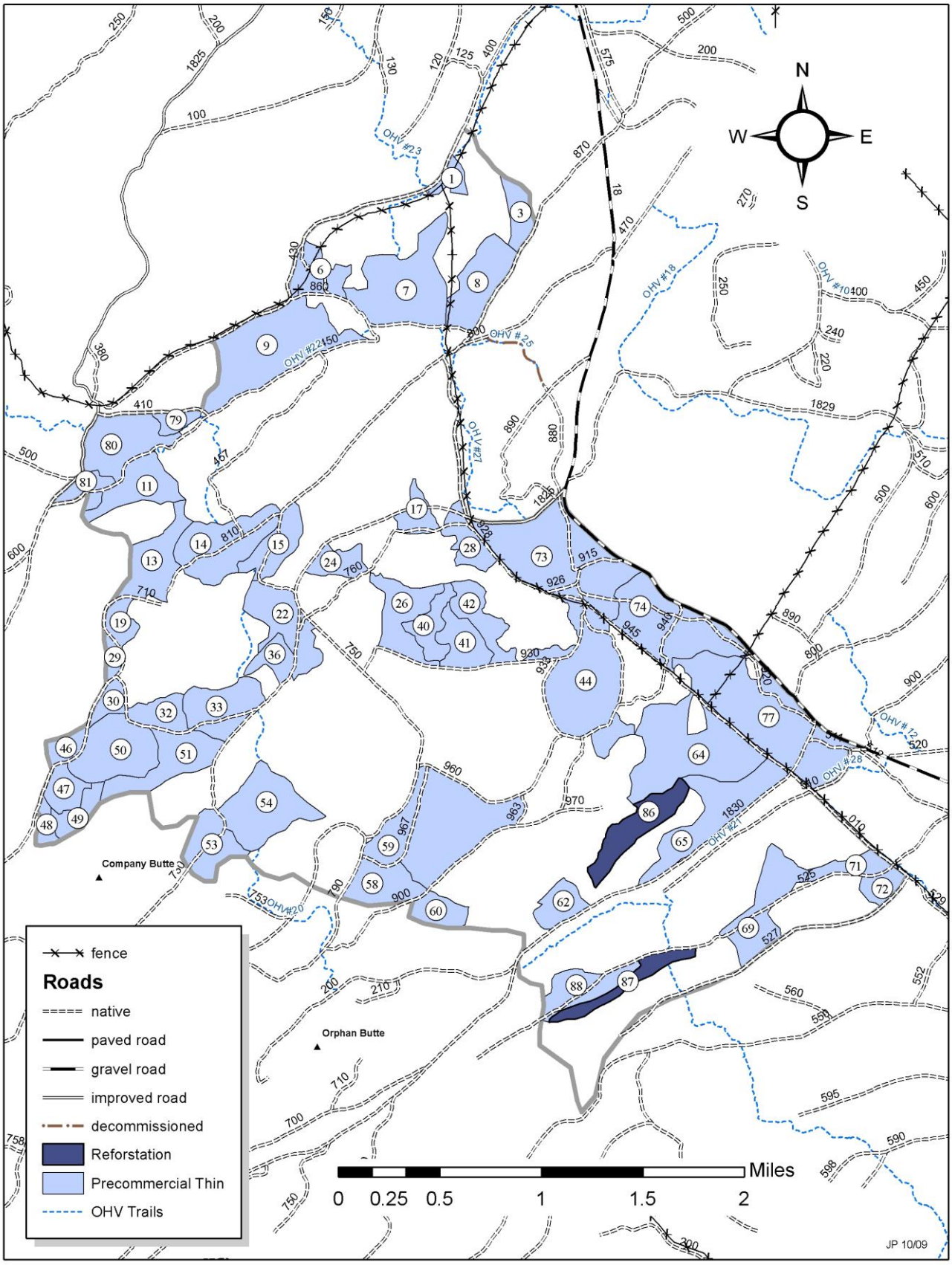


Figure 2.6 Alternative 3 Post Harvest Treatments

Table 2.2 Alternative 3 Harvest Unit Summary

Alt 3 Unit	acres	Harvest			Post Sale Treatment			Fuels Treatments				
		HTH	HSV	HOR	PCT	LFR	REF	LOP	MST	HP	MP	UB
1	13	y			y						y	y
2	42	y										y
3	23	y			y						y	y
4	31	y										y
5	53											y
6	35	y			y			y				y
7	102	y			y						y	y
8	57	y			y						y	y
9	128	y			y			y				y
10	22	y										y
11	46	y			y						y	
12	429	y										y
13	51	y			y						y	
14	73	y		y	y			y				
15	35	y			y						y	
16	233	y										y
17	20	y			y						y	y
18	36	y										y
19	17	y			y						y	
20	85	y							y			y
21	47	y					y	y				y
22	56	60BA +Gap			y			y				y
23	88	y										y

Alt 3 Unit	acres	Harvest			Post Sale Treatment			Fuels Treatments				
		HTH	HSV	HOR	PCT	LFR	REF	LOP	MST	HP	MP	UB
24	22	y			y						y	y
25	53	y										y
26	50	y			y			y				y
27	87	y										y
28	29	y			y			y				y
29	10	y			y						y	
30	16	y		y	y						y	
31	81											
32	25	25-30BA		y	y			y				
33	53	25-30BA			y						y	
34	9	Y, ret PICO				y		y				
35	25	60BA +Gap										y
36	20	Y, ret PICO			y			y				
37	12	y					y	y				y
38	178	y										y
39	281	y										y
40	27	y			y			y				y
41	34	y			y			y				y
42	35	y			y			y				y
43	34											y
44	134	y			y							y
45	47											y
46	15	y			y						y	

Alt 3 Unit	acres	Harvest			Post Sale Treatment			Fuels Treatments				
		HTH	HSV	HOR	PCT	LFR	REF	LOP	MST	HP	MP	UB
47	23	y		y	y				y		y	
48	10	y			y						y	
49	20	y			y						y	
50	68	y			y				y		y	y
51	56	y			y						y	
52	38	y										y
53	41			y	y						y	
54	73											
55	68	60BA +gaps										y
56	86	y							y			y
57	36	y									y	y
58	41	y			y whip			y				y
59	152	y			y whip			y				y
60	23	y			y whip						y	y
61	272	y										y
62	26	y			y whip			y			y	
63	48	y										y
64	123	y			y							y
65	81	y			y		y	y				y
66	305	y										y
67	71	y										y
68	118	y										y
69	62	y			y						y	y
70	66	y										y
71	20	y			y						y	y

Alt 3 Unit	acres	Harvest			Post Sale Treatment			Fuels Treatments				
		HTH	HSV	HOR	PCT	LFR	REF	LOP	MST	HP	MP	UB
72	18	y			y						y	y
73	149	y			y whip			y				y
74	102	y			y whip			y				y
75	13								y			y
76	9								y			y
77	164	y			y						y	y
78	5								y	y		y
79	12				y							
80	62	y			y						y	
81	19			y	y						y	
82	18											
83	42	Y ret PICO			y						y	y
84	15			y							y	
85	19	y										y
86	48	y					Plant PP				y	
87	28	y					Plant PP					
88	39	y		y							y	
sum	5343	5268	0	2440	2531	76	149	1131	289	5	1272	4705

HTH – Commercial Thin
HSV – Salvage Harvest
HOR – Overstory Removal
PCT – Pre-Commercial Thin
LFR – Ladder Fuel Reduction
BA – Basal Area
PP – Ponderosa Pine
LOP – Lop and Scatter Material
MST– Mechanical Shrub Treatment (mowing)
HP – Handpile
MP – Machine Pile
UB – Underburn
PICO – Lodgepole Pine
WHIP – Falling of small trees less than 4.5’ tall

2.2.4 Alternative 3 PFA Management Description

Alternative 3 proposes to manage a northern goshawk post fledgling area (PFA) around an active nest area in a manner similar to that described in the latest paper by Youtz et al. (2007). The suite of treatments would mimic dense areas interspersed with more sparsely forested areas to yield a diversity of densities and structures around the nest site. The extent of the PFA was delineated in coordination with the district wildlife biologist and the silviculturalist and represents the best available habitat. Variability within and between stands, and a greater percentage of mature and old-forest structure, are the main objectives found in the recommendations. It is also consistent with the recommendation of Greenwald et al. 2005 in that the majority of the PFA would be managed to encourage the structural characteristics of mature and old-growth forests. Each of the stand prescriptions would include a 10% retention area (untreated), and two stands would remain untreated in their entirety. As a result, almost 30% of the PFA would receive no treatment. The prescriptions for treated areas intend to thin the stands to levels where bark beetle mortality would not develop as a common problem for more than 10 years, while still maintaining suitable goshawk habitat. Additionally, treatments would reduce the risk of a stand replacement fire.

Within the PFA, existing conditions were exaggerated with treatment in order to increase the diversity of the area. Low density stands were thinned to a lower stocking level. High density stand that currently exhibit the beginnings of multi-story development and advanced development in the understory were left at a higher stocking level.

Figure 2.8 shows a 2006 aerial photo of PFA stands. Note existing different stand structures and densities. Low density stands were thinned to a lower stocking level. High density stand that currently exhibit the beginnings of multi-story development and advanced development in the understory were left at a higher stocking level.

Table 2.3 Treatment Summary for Post Fledgling Area

Treatment	Alt 1 (acres)	Alt 2 (acres)	Alt 3 (acres)
Dense Stands Nest & Replacement Nest	--	81	154
60 Basal Area with Gaps	--	531	218
40-50 Basal Area	--	--	70
25-30 Basal Area	--	--	78

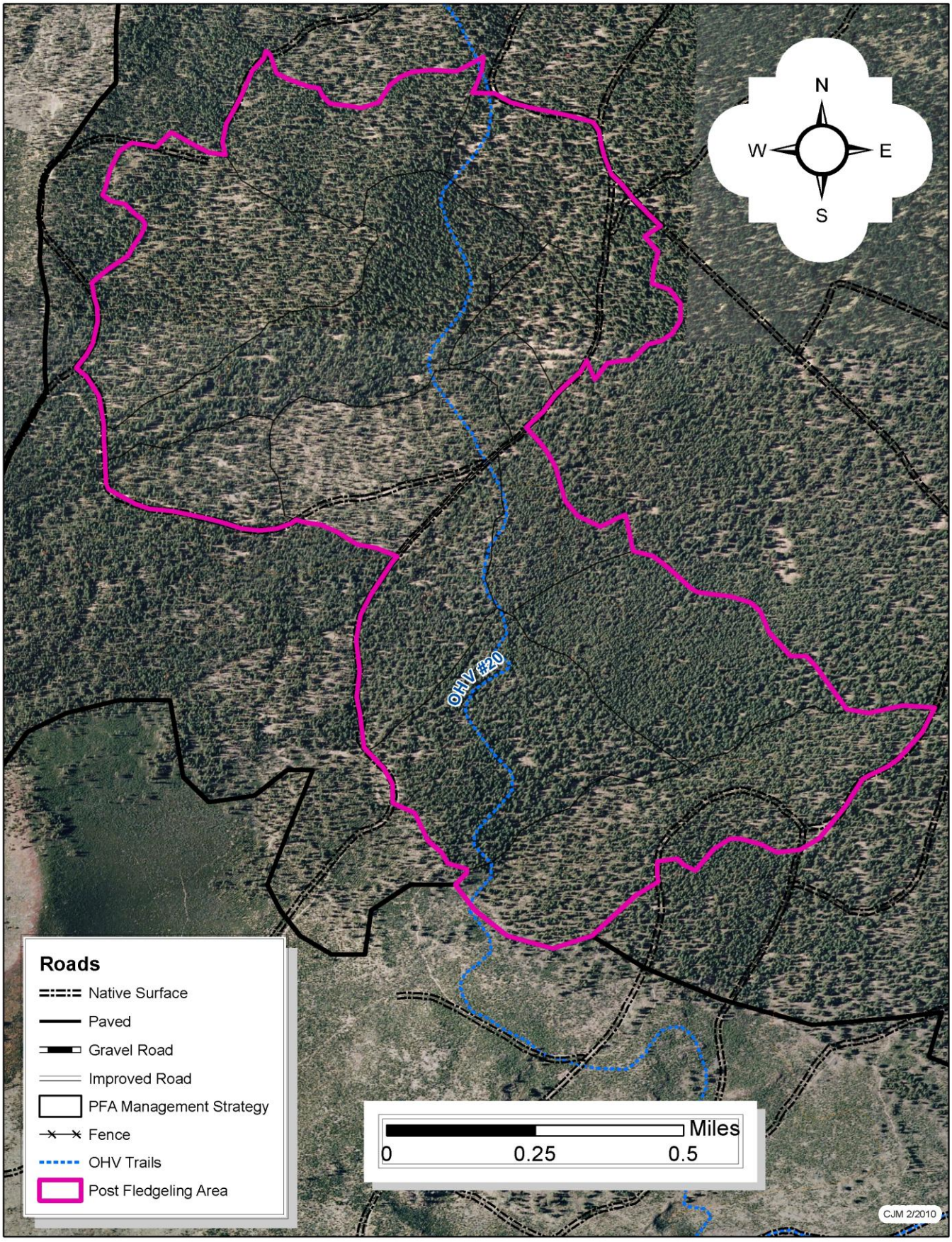


Figure 2.7 Post Fledgling Area Vicinity

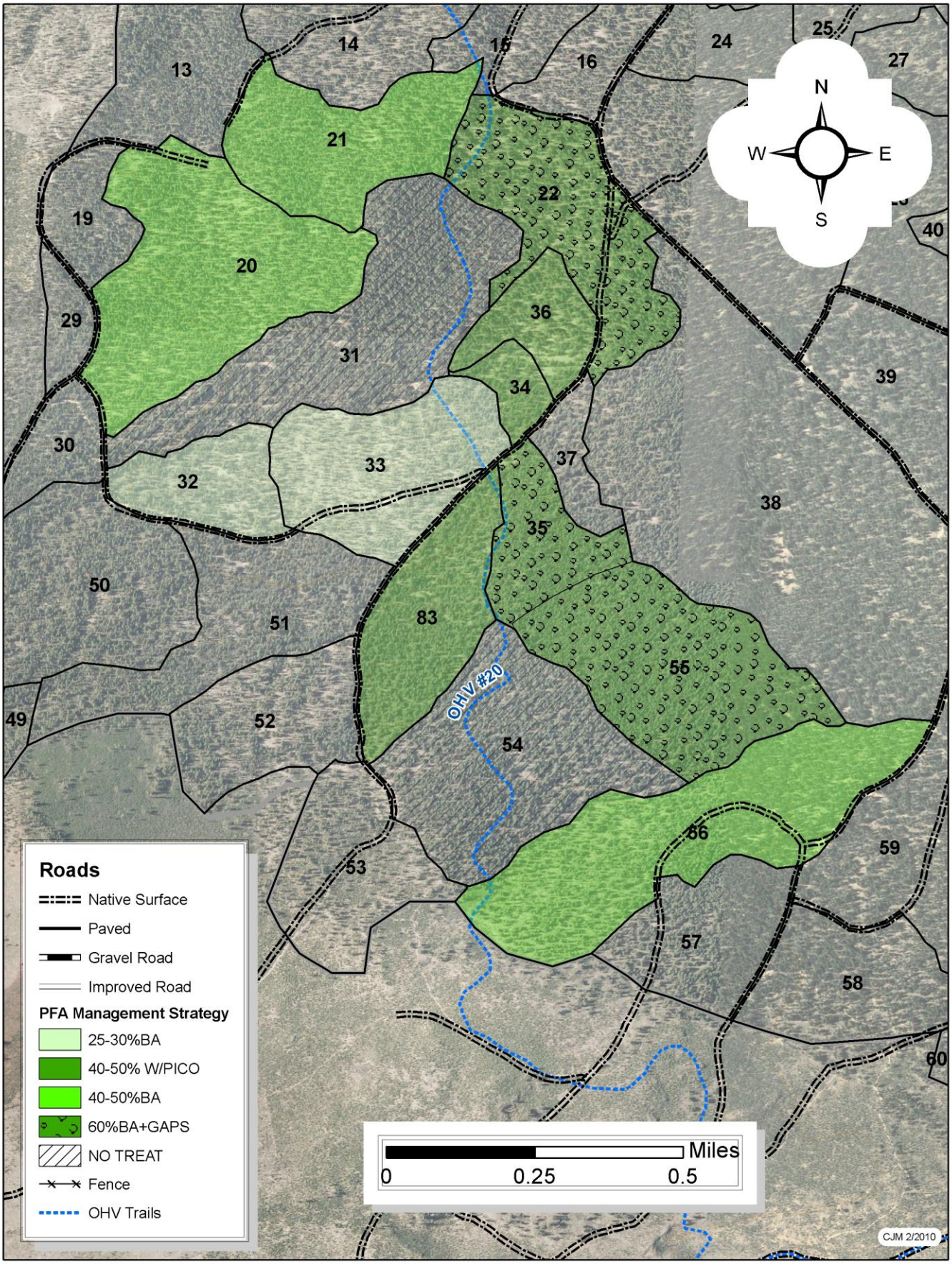


Figure 2.8 Treatments in Post Fledgling Area

No Treatment

Units 31 & 54 (154 acres)
No treatments would be done in either of these two units. This untreated area includes 30 acres which function as the core nest area, and an additional 124 acres for alternate nest sites, and, as part of the PFA, to provide denser, unmanaged forest conditions. These stands are intentionally left dense to mimic conditions found around most goshawk nest sites.

60 Basal Area with Gaps

Units 22, 35, & 55 (91.9 acres)
This prescription would create desired variation with planned openings interspersed with heavier crown canopy than generally desired in the planning area. Thinning from below would occur, leaving the largest dominant and codominant ponderosa pine trees at stocking levels of 60 square feet of basal area. By focusing on the largest trees and the higher stocking levels, a clumpy appearance to stocking can be expected and be accentuated by gaps placed on about 10% of the stand. Gaps could range up to 2 acres each in size. These stands are the densest treated stands and have close crowns.

40-50 Basal Area

Units 20, 21 & 56 (218.3 acres)
This prescription is similar to most of the ponderosa pine stocking prescriptions in the planning area. The variation within the PFA is important to maintain crown canopy levels and open stands that would not be susceptible to bark beetle mortality for at least 20 years. This would be thinning from below leaving the largest dominant and codominant ponderosa pine trees at stocking levels of 40-50 square feet of basal area, while cutting all lodgepole pine in the stand. By focusing on the largest trees, a clumpy appearance to stocking can be expected. Once treated these stands would be open with open overstory and understory.

40-50 Basal Area retain Lodgepole Pine

Units 34, 36, & 83 (70.5 acres)
This prescription is similar to most of the ponderosa pine stocking prescriptions in the planning area. However, leaving lodgepole pine within the stand understory, seedlings and saplings can be expected to develop within 10 – 20 years. The variation within the PFA is important to maintain crown canopy levels and open stands that would not be susceptible to bark beetle mortality, although this can be expected due to leaving larger lodgepole pine in the stand. This prescription is led by thinning from below leaving the largest dominant and codominant trees at stocking levels of 40-50 square feet of basal area. By focusing on the largest trees and recruitment of lodgepole pine in the understory a multi-canopy appearance to stocking can be expected to develop, thus providing tree species diversity for goshawk prey base. Once treated, these stands would support an open overstory above a developing understory of brush and lodgepole pine.

25-30 Basal Area

Units 32 & 33 (78.3 acres)
This prescription is not similar to most of the ponderosa pine stocking prescriptions in the planning area. The variation within the PFA is in currently open stands which would be slightly above the minimum stocking levels desired in the Forest plan and wide open stands in an area which has plenty of consistent crown canopy blackbark ponderosa pine. These open stands would be developed by thinning from below leaving the largest dominant and codominant trees at stocking levels of 25 - 30 square feet of basal area. By focusing on the largest trees and the higher stocking levels, a wide open stand with scattered denser bits would be seen. The open understory would be maintained with periodic underburning. Once treated, these stands would be very open with larger trees and an open understory.

2.3 Connected Actions

Forest Plan Amendment

Both action alternatives include a Forest Plan Amendment described on pages 173, 175-176.

Pre-haul maintenance and road reconstruction

Pre-haul maintenance and road reconstruction would occur at the levels specified in table 2.4 for all action alternatives. These roads are in generally good condition due to light traffic volumes and seasonal access. Road maintenance includes items such as grading and maintaining and or restoring drainage structures. Road reconstruction includes items such as applying surface rock, restoring drainage and grading. Maintenance and reconstruction activities are targeted at problem sites and or stretches of road that need special attention before they can support log haul. Maintenance and reconstruction can happen on the same mile of road and miles may be listed twice in table 2.4.

Temporary road work would occur to facilitate harvest. In alternative 2, a total of 13.5 miles of temporary road would be either reopened or constructed, alternative 3 would need the same temporary road system of 13.5 total miles of temporary road work. Temporary roads are the same for both alternatives 2 and 3 are displayed in figure 2.4. Temporary roads are used to access further reaches of timber sale units to extract timber more efficiently and reduce ground based impacts from skidding long distances without the use of a road system. Temporary roads are built to low specification, just enough to get equipment into landings and are obliterated at the end of the timber sale activity.

Table 2.4 System and Temporary Road Work

Alternative	System Road Pre-Haul Maintenance (mi.)	System Road Reconstruction (mi.)	Temporary Road Reopening (miles)*	New Temporary Road Construction (miles)
1	none	none	none	none
2	21.6	24.6	2.8	10.7
3	21.6	24.6	2.8	10.7

***Almost every entry with ground-based machinery requires the creation of temporary skid roads. Where possible subsequent entries are designed to utilize previous roadbeds. Often these "existing roads" are merely a slight depression in the land or an area where trees were obviously removed to provide access routes. By re-using roadbeds soil disturbance can be reduced and existing access points revisited. These roads are not part of a permanent road system. They are not maintained or tracked. "Existing roads" were located mainly from field reconnaissance and from historic aerial photos that showed previous logging entries. Delineating these "existing roads" also helps the sale administration team locate skid roads efficiently and with**

Precommercial Thinning (PCT)

Precommercial trees are greater than 4 feet tall but have a dbh less than 7". Precommercial thinning is used in two different situations. One is in regeneration stands which are now stocked with saplings. The second situation is in stands where there is an overstory and an understory which competes with the

overstory, acts as ladder fuels and stocks openings in the overstory crown cover. Precommercial thinning in the Flank area would be used in both these situations. Within plantations which were planted or naturally seeded two to three decades ago the stocking of the trees is at a level where there is inter tree competition which is causing reduced growth and self pruning of lower branches. These stands also would not likely survive a light underburn or wild fire due to the tree densities and arrangement of other fuels including brush. Thinning in these stands would leave trees on 16 to 25 foot spacing in order to increase growth and followed with fuels treatments increase the chance of surviving fires.

In the Flank project, precommercial thinning would also be used to manage the understory through stands which have multi canopy characteristics. This thinning leaving the biggest tree which is not in competition or acting as ladder fuels into the crown would be left on 20 to 30 foot spacing. Where underburning is planned it may occur before the thinning to reduce the chance of killing desired trees which were left. Trees not killed by underburning would be thinned thus leaving the areas needing a few trees stocked.

Whip Falling (WHIP)

Whips are trees less than 4' tall. Whip falling is used in commercially thinned units to remove the non merchantable trees left which are not desired due to disease or poor condition including small crowns, bole damage or very poor growth.

Reforestation (REF)

Reforestation may be needed in stands where removal of the lodgepole pine overstory results in unerstocked areas. Areas greater than 5 acres in size may require planting of ponderosa pine seedlings to ensure good stocking and dominating the regeneration with desired species. Reforestation in these small areas would require some control of competing grass and shrubs to ensure the survival and growth of planted trees and protection from large game browse. Control of grass and shrubs would be accomplished with mowing, scarification or other manual treatment methods. No herbicide would be used.

Ladder Fuel Reduction (LFR)

Ladder fuels reduction is used instead of PCT where objectives are for fuels purposes not silvicultural purposes. The practice involves mechanically cutting understory trees 7" dbh and less at a predetermined spacing. The desired residual stocking of trees under 7" dbh varies and is dependant on the overall stand density and structure. LFR treatments are designed to reduce ladder fuels, thus reducing the potential for crown fire initiation.

Lop and Scatter (LOP)

Lop and scatter typically occurs in light thinning slash where prescribed fire would be used as a final fuels treatment. Lopping consists of cutting the limbs off of thinned trees rearranging the fuel bed to 15" or less off the ground. Lopped slash located beneath residual trees would be manually scattered out from below tree canopies to ensure low fire intensities in these areas during prescribed fire operations.

Mechanical Shrub Treatment (MST)

Mechanical shrub treatment consists of mowing brush in and around ponderosa pine stands. On flatter ground a rubber tired tractor equipped with a rotary mower would be utilized for MST treatments. Slopes over 20% would require a light tracked machine with a front mounted mow deck in order to access the steeper slopes. The targeted brush species are bitterbrush and manzanita. Brush is mowed to a height of 8" and may occur on up to 70% to 80% of the area within specified units.

Handpiling (HP)

Hand piling consists of piling natural and activity created fuels by hand. Completed pile dimensions would be approximately 6' long by 6' wide by 5' in height. The amount of piles per acre would fluctuate along with fuel loadings and are expected to occur at a rate of 18 to 24 piles per acre. Piles would be

burned in the late fall or winter season when moisture levels prevent fire spreading to surrounding areas.

Machine Piling (MP)

Machine piling consists of piling natural fuels and activity created fuels utilizing a Grapple Machine. Pretreatment fuel loading would generally be greater than 16 tons per acre where machine piling occurs and completed pile dimensions would be approximately 12' long by 12' wide by 8' in height and would occur at a rate of 6 to 10 piles per acre. Piles would be burned in the late fall or winter season when moisture levels prevent fire spreading to surrounding areas, providing requirements for DWD are met.

Underburning (UB)

Underburning consists of burning natural fuels and activity produced fuels located in timbered stands. Slash is ignited under predetermined weather conditions in order to minimize tree mortality of residual stands. Underburning can occur as a sole treatment and in combination with other treatments developed to meet fuel reduction objectives.

Forest Plan Amendment

Both action alternatives would require a non-significant Forest Plan Amendment to waive Standard and Guide WL-54, which requires that 30 percent of the National Forest System land within winter range or Management Area 7 Deer Habitat (MA 7) provide. This amendment is needed to obtain the desired future conditions needed to move toward a set of conditions that mimic the historic range of variability (HRV). The objective stated below would be amended for thermal cover:

> "Ideally, cover and forage areas should be in close proximity for optimum use by big game, with cover making up 40 percent of the land area. Approximately three-quarters of cover areas should be thermal cover with the remainder being hiding areas (LRMP, page 4-113)."

2.4 Mitigation Measures

Mitigation measures reduce potential impacts caused as a result of the alternatives. Mitigation measures come from the LRMP, Standards and guidelines, best management practices and other existing direction. Mitigation measures may apply to any action alternative. The Council of Environmental Quality (CEQ) defines mitigations measures as:

- avoiding the impact all together by not taking a certain action or certain parts of an action,
- minimizing impacts by limiting the degree of magnitude of the action and its implementation, rectifying the impacts by repairing, rehabilitating, or restoring the affected environment,
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action or, compensating for the impact by replacing or providing substitute resources or environments.

Table 2.5 Mitigation Measures

Units	Mitigation Measures
20, 50, 56	Units would be thinned, then mowed, and then burned when sufficient fuels have accumulated to carry a fire (within 3 years after thinning), and then burned a second time when sufficient fuels have accumulated to minimize re-establishment of manzanita and its seed-bank. Dates: Within 3 years after thinning, and again after sufficient fuels have accumulated.

Units	Mitigation Measures
75, 76, 78	Units would be mowed before underburning to minimize scorch and mortality
Units not in MA-7 (Deer Winter Range)	Maintain a minimum of 20-30% of shrubs in a mosaic of untreated patches by using drip line burning or other methods to meet deer forage and migratory bird objectives.
1-8, 18, 73, 74, 77, 78, 67, 70-72, 17, 28, 27, 44, 45, 75, 69	Maintain a minimum of (40-50% in M7) of shrubs in a mosaic of untreated patches by using drip line burning or other methods to meet deer forage and migratory bird objectives.
Units >30% slope	Restrict mechanical disturbance on slopes greater than 30 percent to designated areas (i.e., roads, landings, designated skid trails) at all times and require operators to winch logs to skidders from these areas. Hand felled trees would be directionally felled toward pre-approved skid trails. Exceptions for areas that make up less than 10 percent of an activity area would be subject to Forest Service approval.
5, 7, 9, 11,13,16, 20, 21, 22, 23, 26, 27, 33, 34, 38, 39, 40, 41, 43, 49, 50, 55, 56, 61, 64, 65, 66, 73, 77, 80, 86	Decommission (obliterate) all temporary roads created for the current entry. Subsoil or utilize excavator bucket teeth to loosen compacted soils on all temporary roads. Pull slash and woody materials over treated surfaces to establish effective ground cover protection where available.
1, 2, 4, 7, 9, 10, 12, 14, 15, 21, 22, 31, 33, 35, 44, 45, 53, 54, 57, 58, 64, 65, 66, 67, 68, 71, 72, 73, 74, 75, 76, 77, 79, 87, 80, 73	During operations OHV trails east of Road 18 and north of Road 1835 would be closed in the following logical segments: Trail 20 from junction of trail 02 at Camp II Staging Area north to junction of trail 21, 22 or 24 dependent on location of actives. Trail 21 in its entirety, if 20 and 25 are closed north and south of trail 21 junctions. Trail 22 (Shared Use Road 450) in its entirety, if 20 and 25 are closed north and south of trail 22 junctions Trail 23 in its entirety, if 20 and 25 are closed north of trail 22 Trail 25 from junction of trail 10 at Camp II Staging Area north to junction of trail 21, 22 or 26 dependent on location of actives Trail 27 in its entirety, if 25 is closed between 21 and 22 Trail 28 in its entirety, if 25 is closed between 21 and 22 Shared Use Road 940 in its entirety, if 25 is closed between 21 and 22
1, 2, 4, 7, 9, 10, 12, 14, 15, 21, 22, 31, 33, 35, 44, 45, 53, 54, 57, 58, 64, 65, 66, 67, 68, 71, 72, 73, 74, 75, 76, 77, 79, 87, 80, 73	Restrict operations that affect the OHV trails All trails need to stay open during this time period. Dates: Last week of April through Memorial Day
All	To protect the trail prism, equipment wider than 50 inches would not be used on OHV trails.
All	Roads or old skid trails that have been obliterated and converted to trails would not be used for hauling, skidding, or other treatment operations.
All	Remove all slash from trails and shared use roads in a timely manner upon completion of the payment unit. OHV trails would be clear of logging debris and maintained open when operations are not occurring.
All	Clean all equipment before entering and after leaving National Forest System lands. Remove mud, dirt, and plant parts from project equipment before moving it into the project area and before proceeding to the next project.

Units	Mitigation Measures
All	If fill material is proposed to be used, the botanist or her designee would inspect it for weeds prior to use.
41, 26, 39	Vehicles would avoid the cheatgrass patch associated with the corner of the tank in the SW corner of unit 41. This is an old landing and may not be used as such in future sales.
16, 22, 23, 39, and 44	Leave a 100 foot buffer around the water set and troughs to prevent spread of cheatgrass under all treatment methods.
NA	The Benham Falls Day Use Area is the preferred site for dust abatement water withdrawal. Any other water source proposed for this project would be evaluated for weeds by the district botanist or her designee and if weeds are found, another source may be recommended, or if possible, the site would be treated prior to use.
Units	Limit fuel treatments such as mowing and prescribed burns that may adversely affect ground nesting birds between April 15th and July 30th. Treatments that must occur during this time would maintain a mosaic of treated and untreated shrubs should provide some mitigation to treatment that cannot be done outside this period. This would be accomplished through maintaining 20-30% shrubs except in MA-7 where we would maintain 40-50% shrubs.
Units	Large ponderosa pine snags (>20" dbh at the large end) and large down logs (>20" diameter at the large end and 10' in length) would be protected from prescribed fire by stopping lighting within 50 feet of these features. When the burn plan is being written fuels specialist would consult the district biologist who would help locate these features and determine additional protection needs.
	Where vegetation treatments require a period of rest from livestock grazing a precise treatment schedule needs to be developed and the period of rest needs to be specified by treatment unit. The individual treatment unit(s), with their associated period of rest, would need to be grouped by pasture and allotment to evaluate the effect on grazing operations on the affected pasture(s)/allotment(s).
	Manage treatment activities so that no more than one pasture a year would require non-use by the permittee during a given grazing season.

2.5 Project Design Criteria

Project design criteria are management requirements or actions common to most projects that provide resource protection to ensure activities are consistent with the Deschutes Forest Plan Standards and Guidelines. Design criteria would be in place unless directed otherwise or waived by Forest Service personnel. Common design criteria are listed in table 2.6.

Table 2.6 Project Design Criteria

Units	Design Criteria & Management Requirements
All	Units would be evaluated for similar fuels conditions; underburns would use trails and roads as boundaries to reduce resource damage, and to make influential treatment at the landscape level. Underburn unit boundaries may not necessarily follow timber sale boundaries.
All	Units that are underburned may be reentered to meet and maintain desired fuels objectives and condition class.

Units	Design Criteria & Management Requirements
All	Underburning in plantations would not light around trees less than 6 inches in diameter. (TM-53)
All	Large ponderosa pine snags (>20" dbh) and large down logs (>20" diameter and >10' in length) would be protected from prescribed fire by stopping lighting within 50 feet of these features. When the burn plan is being written fuels specialist would consult the district biologist who would help locate these features and determine additional protection needs.
All	Within black bark thinning stands which have been previously thinned for 10% retention areas, use previous retention areas. (LRMP WL-59)
14, 30, 32, 47, 53, 81, 84, 88	Within Harvest Overstory Removal (HOR) units Green Tree Replacements (GTR) would be left in groups (TM-4) Retention patches and GTRs would overlap where possible. GTRs would provide 100% potential population level as directed by the Eastside Screens.
14, 30, 32, 47, 53, 81, 84, 88	During treatment activities in Harvest Overstory Removal (HOR) units advanced regeneration (trees larger than 4 ½ feet) would be protected. (TM-44 & 53)
All	Openings larger than 4 acres caused by management activities which do not contain adequate advanced regeneration would be evaluated for reforestation. An area is considered an opening when: It is wider than 250 feet and stocking is less than a stand density index of 36.5
All	Underburning would be accomplished during conditions which would leave at least 40% crown on dominant and codominant trees, This generally should result in a crown scorch less than 50% of leave tree crowns. To reduce the potential for long-term growth and bark beetle induced mortality of ponderosa pine.
All	Burn piles would not be placed within heritage site boundaries, eliminating the direct effect of extreme heat on sites and artifacts.
12, 14, 16, 20, 21, 23, 32, 33, 35, 36, 39, 47, 50, 53, 56, 59, 67, 70, 75, 76, 78, 79, 80, 81 & 88	Apply restoration treatments (subsoiling) to primary skid trails and landings in order to reduce overall impacts. These units have prior entries and elevated existing detrimental conditions that are likely to need subsoiling restoration treatments of previous impacts. This may include the CT6.6# provision.
Commercial Units	Construct and maintain temporary roads to minimize the erosive effects of concentrated water during operations. Waterbar temporary roads following completion of haul activities (Road BMP R-7). *Moderate effectiveness*
All	Include soil moisture guidelines in prescribed burn plans to minimize the risk of intense fire and adverse impacts to soil and water resources (LRMP SL-1 & SL-3; Timber BMP T-2, T-3 & T-13; Fuels Management BMP F-2, F-3). *Moderate to High effectiveness*.
All	Strive to maintain fine organic matter (organic materials less than 3-inches in diameter; commonly referred to as the duff layer) within each activity area during harvesting and post-harvest operations. (LRMP SL-6; Fuels Management BMP F-2; Timber Management BMP T-13). *Moderate effectiveness*.
Commercial units	In all proposed activity areas, locations for new yarding and transportation systems would be designated prior to the logging operations. This includes temporary roads, spur roads, log landings, and primary (main) skid trail networks. (LRMP SL-1 & SL-3; Timber Management BMP T-11, T-14 & T-16). Moderate effectiveness.

Units	Design Criteria & Management Requirements
Commercial units	Maintain spacing of 100 to 150 feet for all primary (main) skid trail routes, except where converging at landings. Closer spacing due to complex terrain must be approved in advance by the Timber Sale Administrator.
Commercial units	Restrict grapple skidders to designated skid trails
Commercial units	Limit the amount of traffic from other specialized equipment off designated areas such as landings and skid trails.
Commercial units	Minimize machine trips to accumulate harvested material for yarding to two or fewer round trips over the same piece of ground.
Commercial units	Directionally bunch material along pre-approved skid trails, and suspend the leading end of trees during skidding operations.
All	Avoid equipment operations during times of the year when soils are extremely dry and subject to excessive soil displacement. Avoid equipment operations during periods of high soil moisture, as evidenced by equipment tracks that sink deeper than during dry or frozen conditions.
All	Minimize off trail traffic of machinery to two or fewer round trips over the same piece of ground.
23, 26, 27, 35, 37, 38, 42, 54, 55, 56, 57, 58, 83	Prioritize areas of slope exceeding 30% for leave areas where present.
Commercial Units	Restrict grapple skidders to designated areas (i.e., roads, landings, designated skid trails), and limiting the amount of traffic from other specialized equipment off designated areas. Harvester shears would be authorized to operate off designated skid trails at 30 foot intervals and make no more than two round trips on any site-specific area to accumulate materials.
All	Grapple pile only from existing skid trails or those created during yarding operations.
All	Assure that water control structures are installed and maintained on skid trails that have gradients of 10 percent or more.
23, 26, 27, 35, 37, 38, 42, 54, 55, 56, 57, 58, 83	Restrict mechanical disturbance on slopes greater than 30 percent to designated areas (i.e., roads, landings, designated skid trails) at all times and require operators to winch logs to skidders from these areas. Hand felled trees would be directionally felled toward pre-approved skid trails. Exceptions for areas that make up less than 10 percent of an activity area would be subject to Forest Service approval.
	On Ponderosa Pine sites, a minimum of 5 to 10 tons per acre of large woody debris (greater than 3-inches in diameter) is retained within activity areas to provide organic matter reservoirs for nutrient cycling that helps maintain long-term site productivity (LRMP SL-1).
All	Use standard contract provisions for protection of improvements to repair or replace trails, signs, road closures, fences, barriers, or other improvements that are impacted by treatment operations.
1, 2, 4, 7, 9, 10, 12, 14, 15, 21, 22, 31, 33, 35, 44, 45, 53, 54, 57, 58, 64, 65, 66, 67, 68, 71, 72, 73, 74,	OHV trails impacted by logging activities must be closed by OHV specialist personnel prior to logging operations. OHV specialist would install closure signs, public notification, or other actions to improve rider safety.

Units	Design Criteria & Management Requirements
75, 76, 77, 79, 87, 80, 73	
1, 2, 4, 7, 9, 10, 12, 14, 15, 21, 22, 31, 33, 35, 44, 45, 53, 54, 57, 58, 64, 65, 66, 67, 68, 71, 72, 73, 74, 75, 76, 77, 79, 87, 80, 73	In treatment units that contain OHV trails that are not on roads, operations would leave enough trees and untreated material within 30 feet of the trail to maintain the integrity of the trail alignment and protect the "forest" experience created by the natural environment.
All	When using OHV trails as fire lines or boundaries for burning units, offset the ignition line 30 feet from the trail and allow the fire to creep back to the trial/fireline verses igniting adjacent to the trail.
All	To protect the trail prism, equipment wider than 50 inches would not be used on OHV trails.
All	To protect the integrity of the OHV trail system closed roads that have been reopened to provide unit access, or spur roads and skid trails within treatment units that cross OHV trails would be ripped, blocked, or otherwise treated to deter vehicle access. This work would be done within 30 days after finishing each entry into a unit.
Units >20% slope	Where OHV trails pass through units that contain slopes over 20 percent, do not create open corridors during unit layout and implementation that could become hill climbs. Fall trees, place slash, rocks, or other natural debris within and across any corridors to prevent or disrupt motorized travel.
All	Avoid trail crossing whenever possible. Require equipment to cross trails at right angles. Minimize the number of crossings with no crossings closer than 100 feet apart. Mark approved crossing locations with contractor/purchaser.
All	Remove all slash from trails and shared use roads. For commercial harvest and fuel reduction operations, removal would occur within 72 hours of completion of operations. For non-commercial operations, removal would be within 24 hours after creation. Block all skid trails and fire lines that intersect with designated trails and shared use roads. Use slash materials and other local, natural All forest material – logs, rocks, brush, etc. – that was disturbed/displaced during operations.
All	Clean all equipment before entering and after leaving National Forest System lands. Remove mud, dirt, and plant parts from project equipment before moving it into the project area and before proceeding to the next project.
All	If fill material is proposed to be used, the botanist or her designee would inspect it for weeds prior to use.
All	Avoid parking vehicles or machinery on any obvious patches of cheatgrass.
All	Bend/Ft Rock wildlife biologist would be notified immediately of discovery of any

Units	Design Criteria & Management Requirements
	active raptor nest.
All	Activities near known or discovered raptor nests must observe the seasonal restrictions. Restrictions would be waived if a nest is found to be inactive. Dates vary by species, consult wildlife biologist.
Dispersed throughout deer summer range units; see Figure 2.1	Hiding areas must be present over at least 30 percent of National Forest land in each implementation unit. To be suitable as a hiding area, residual clumps of one half acre or larger stands within units with advanced regeneration (trees including whips up to 7 inches diameter) and at least 12 trees greater than 7 inches per acre remaining after harvest (WL-54).
Dispersed throughout deer summer range units; see Figure 2.1	Deer hiding cover in “Black bark” ponderosa pine (50 to 80 year old stands) would be managed by retaining approximately 10 percent of treated stands in clumps that would provide visual screening throughout the area (WL-59).
1-10, 12, 16-18, 27, 28, 44, 45, 64-78	Approximately 30% of cover areas should be thermal cover (cover is a crown cover greater than 40% with trees 30 feet tall) with 10% as hiding cover. As a minimum, canopy cover must be 40 percent, but a greater canopy cover percentage is preferred.
1-10, 12, 16-18, 27, 28, 44, 45, 64-78	There would be operational restrictions, including hauling from Dec. 1st through March 31st to minimize wildlife disturbance in winter range areas that overlap with the Opine project. This seasonal closure was signed as part of the Opine project and is a Green Dot Closure.
1-10, 12, 16-18, 27, 28, 44, 45, 64-78	The LRMP guidance for forage is to design treatment units to 300-500 acres including unmanipulated islands. If more than one unit is treated in a single year, treatment units should be 600 to 1,200 feet apart (M7-15).
1-10, 12, 16-18, 27, 28, 44, 45, 64-78	Burning prescriptions would provide for the reestablishment of bitterbrush within 20 years, while only 2.0-2.5% burned annually in the Paulina Herd unit.
61, 44	Protect guzzlers within the project area from logging, road construction/deconstruction and prescribed fire activities including the maintenance of a vegetative buffer of at least 100 feet to maintain habitat for birds and other wildlife using the sites.
47, 75, 76, 78	Use mowing height of 6-8 inches or higher to reduce impacts to bitterbrush and improve the recovery rates to benefit mule deer and shrub-dependent migratory birds.
All	In units identified for mechanical brush treatment (mowing), the equipment would avoid known heritage site boundaries, eliminating the impacts from turning the equipment around.
20, 50, 56	In manzanita-dominated units there is no minimum height for mowing.
All	Retain at least 3-6 logs/acre >12” diameter at the small end in ponderosa pine habitats and at and at least 15-20 logs per acre >8” diameter at the small end in lodgepole pine habitats (Screens Direction).
All	Develop prescribed burn prescriptions to minimize charring of logs (LRMP Standard WL-72). Fire prescription parameters would ensure that consumption would not exceed 3 inches total (1.5 inches per side) of diameter reduction in featured logs (Eastside Screens).
1-10, 12, 16-18, 27, 28,	Burning prescriptions within MA7 would provide for the reestablishment of bitterbrush within 20 years (M7-26).

Units	Design Criteria & Management Requirements
44, 45, 64-78	
1, 2, 4, 5, 6, 8, 9, 27, 28, 64, 65, 67, 71, 72, 73, 74, 75, and 77	Avoid all fences when conducting mechanical shrub treatment. Protect fence or return to pre-treatment condition after harvest and fuels work is completed.
1, 2, 4, 5, 6, 8, 9, 27, 28, 64, 65, 67, 71, 72, 73, 74, 75, and 77	Wood components such as posts, corner braces, and tree scabs should be avoided and/or protected during burning operations by lining the braces and trees as needed. Leave all live trees that are part of the existing fence (wires, tree scabs, etc, attached to the tree). For fences constructed with mainly wood materials, avoidance and protection is required as these materials are subject to damage by even low intensity fires. *Note: Low intensity fires do not cause major impacts to metal fences or their components (barbed wire and metal fence posts). Barbed wire is discolored but is not affected. The paint on metal posts is often burned off, but does not effectively shorten the life of the fence.*
All	In locations of project activities using heavy equipment, direct effects on cultural resource sites would be mitigated by the project design criteria of buffering site boundaries and avoiding all direct or indirect activity within the sites. This covers all grapple piling and harvest including cable yarding, temporary road building and subsoiling, and creation of skid roads and landings. Site boundaries with an appropriate buffer (typically 30 meters) would be identified and flagged by project archeologists, their on ground locations would be provided to the project manager, and sites would be avoided by project activities. There would be no direct effects on these sites if these protection measures are appropriately implemented. Undiscovered and unrecorded heritage resources that are identified during project implementation would be protected until they are evaluated by the Bend-Fort Rock District Archeologist. As per contract /USFS in-house specifications, all treatment activities would cease in the vicinity of such a discovery until the archeologist completes the appropriate site assessment.
All	Undiscovered and unrecorded heritage resources that are identified during project implementation would be protected until they are evaluated by the Bend-Fort Rock District Archeologist. As per contract /USFS in-house specifications, all treatment activities would cease in the vicinity of such a discovery until the archeologist completes the appropriate site assessment.
22 and 74	The range manager on the Forest must flag the CT study plots prior to treatment to avoid disturbance to plot stakes and should be on site during implementation if possible. The area can be treated at low intensity, if the ground identifiers are not compromised. Locations: (CT #5) Road 1825 T20S., R13E., Section 23, SE ¼ and (CT #6)Road 18. T20S., R14E., Section 19, SE 1/4.
22 and 74	No burning would occur on current trend (CT) plots. Protect by providing a three acre buffer centered on the actual transect. Each plot consists of a metal “T” post and from 6 to 9 metal aluminum stakes driven into the soil. Plots must be “read” prior to operations, consult with Range Specialist. Locations: (CT #5) Road 1825 T20S., R13E., Section 23, SE ¼ and (CT #6) Road 18. T20S., R14E., Section 19, SE 1/4.

Units	Design Criteria & Management Requirements
All	If vegetation project activities occur during an active grazing season, any gates must be closed by contractors and administrative personal on pastures where livestock are present.
28, 74, 65	Avoid dragging surface materials such as dirt, cinders or gravel into or over cattle guard decks or grates that would cause them to "fill-up" and require additional future work. Cattle Guard Locations: Road 1825. T20S, R13E, Section24, NE ¼ and Road 18. T20S, R14E, Section 19, SE ¼ and Road 1830. T20S, R14E, Section29, SW 1/4.
12, 21, 23, 38, 74(two watersets)	Protect trough & current condition of waterset sites or return to pretreatment condition after activity treatment. May require internal cooperation on timing of activities between range department & implementer (Approximately 1 acre in size). Cheatgrass (*Bromus tectorum*) may be present in disturbed zone. See specialist report for legal location of watersets.
1, 2, 4, 5, 6, 8, 9, 27, 28, 64, 65, 67, 71, 72, 73, 74, 75, and 77	Where access is needed through an existing fence by equipment, consider the following recommendations: 1) cut fence at strategic locations where there is a tree or other solid support to maintain the strength of the fence and allow for a tight fence when repaired, 2) repair all fences by the time livestock are in the area, 3) reclaim temporary roads in a manner that does not encourage the public to "re-cut" fences after treatment, and 4) schedule activities (harvesting/grazing) at separate times if at all possible.
	Conduct regular preventive maintenance to avoid deterioration of the road surface and minimize the effects of erosion and sedimentation (Road BMP R-18, R-19). *Moderate to High effectiveness.*

2.7 Overview of Alternatives

Alternatives	Thin (acres)	Overstory Removal (acres)	Salvage (acres)	Volume (MMBF)	Fuel Treatment (table 1.1 shows description of treatments)	Reforestation Surveys (REF) Precommercial Thinning (PCT)	Acres Gaps	Retain Trees With Old Growth Characteristics	Decommissioning/ Closure; Road Density (in the project area)	Temp Roads (miles)	
										Existing	New
Alt. 1 No Action – 0 ac	0	0	0	0	None	None	~20% has existing gaps	NA	Close 0 miles Decommission 0 miles 2.33 mi/mi^2	0	0
At. 2 Proposed Action 5688 ac	5341	251	857	14.5 MMBF	149 (LFR) 1,131 (LOP) 266 (MST) 5 (HP) 1,345 (MP) 4,902 (UB)	76 (REF) 2,513 (Vegetation PCT) 149 (Fuels PCT)	~20% has existing gaps ~20-25% would have created gaps after treatment	No	Close 2.3 miles Decommission 4.0 miles 1.54 mi/mi^2	2.8	10.7
Alt. 3 5615 ac	5,268	251	0	14.2 MMBF	149 (LFR) 1,131 (LOP) 266 (MST) 5 (HP) 1272 (MP) 4,705 (UB)	76 (REF) 2,440 (Vegetation PCT) 149 (Fuels PCT)	~20% has existing gaps ~20-25% would have created gaps after treatment ~15 acres of gaps would be created in PFA	Yes (additional information located in section 1.6.1)	Close 2.3 miles Decommission 4.0 miles 1.54 mi/mi^2	2.8	10.7

Table 2.7 summarizes many, but not all of the main points by alternative for each resource area. Additional information and further analysis can be found in relevant sections of chapter 3 of this document.

Table 2.7 Comparison of Alternatives

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
Vegetation				
Resistance to Insects & Disease	%	31% have resistance to beetle kill mortality	89% have resistance to beetle kill mortality 5,011 acres treated Reduced stocking levels would allow future growth with low risk of beetle infestation. Reduced mortality would promote development of large trees	89% have resistance to beetle kill mortality 4,945 acres treated Reduced stocking levels would allow future growth with low risk of beetle infestation. Reduced mortality would promote development of large trees
Historic Range of Variability	Trees per acre	No late old structure is present. In 10 years there would be 7 trees per acre greater than 20 inches.	Dense multi-layer stands would be moved to understory reinitiation which has more potential to become open large pine structure. In 10 years there would be 11 trees per acre greater than 20 inches	Dense multi-layer stands would be moved to understory reinitiation which has more potential to become open large pine structure. In 10 years there would be 11 trees per acre greater than 20 inches
Resistance to Fire Mortality	Diameter (DBH)	Average diameter is 8.6” At least half the trees are not resistant to fire at 4’ flame lengths, across the entire project area	Average diameter is 13.8 “ All trees resistant to 4’ flames, half the trees are resistant to 8’ flames. 10% of units are untreated (left as wildlife clumps) and have low resistance to fire and slower growth rates. 4,807 acres would be resistant to mortality caused by wildfire.	4,741 acres would be resistant to mortality caused by wildfire.

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
Mistletoe Spread and Intensity	Thinned stands	Mistletoe intensity would limit tree growth by more than 10% in 30 years	Stocking reduction on 554 acres of stands infected with mistletoe	Stocking reduction on 481 acres of stands infected with mistletoe
Fire & Fuels				
Condition Class (% of planning area)	Condition Class	CC1 = 4% CC2=71% CC3=25%	CC1 = 36% CC2=50% CC3=14%	CC1 = 34% CC2=50% CC3=15%
Fire Behavior Potential (acres)		Low (<4' flames) =6 Moderate (4' flames)= <1 High (>8'flames) =94	Low (<4' flames) =6 Moderate (4' flames)= 78 High (>8'flames) =16	Low (<4' flames) =6 Moderate (4' flames)= 78 High (>8'flames) =16
Mortality expected from a wildfire event under 90th percentile weather conditions	% trees killed	90-99 percent of trees 5 to 25 inches in diameter would be killed in a wildfire event	4 to 25 % of trees 5 to 25 inches in diameter would be killed in a wildfire event	4 to 25 % of trees 5 to 25 inches in diameter would be killed in a wildfire event
Wildlife				
Snags, Coarse Woody Material and Green Tree Replacements				
Coarse Woody Material (Eastside Screens requires: PIPO=1/acre >20", 3/acre>10" PICO=6/acre >10"	Size and number per acre	Maintained	Removed to minimize levels (Pete's suggestion)	No salvage
Green Tree Retention Areas		Maintained in the short term	Reduced	Reduced
Snags Maximum Population Potential PIPO=4 snags/acre PICO=6 snags/acre With a 20 year interval between treatments, 8 green trees would be needed in PIPO and 12 green trees	Short Term (0-10yrs)	• S&G's would be met in 10 yrs for small diameter snags • large diameter snags	• small diameter snags, removed from 771 acres due to salvage harvest. • large diameter snags no short term impacts salvage harvest on 771 acres (90% of	• Snags provided at 2 to 2.5/acre • no short term impacts to large diameter snags

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
would be needed in PICO			the 857 acres slated for salvage) Has a big effect locally but across the two subwatersheds, this only represents 1% of the area. Snags are deficient in the planning area and species that require high densities of snags would be negatively affected by this alternative.	
	Long Term (11-30yrs)	• small diameter snags • large diameter snags remain below S&Gs (30 yrs).	• small diameter snags remain below S&Gs (20-30yrs) • prescribed or wildfires could result in meeting S&G's much sooner • large diameter snags likely would meet S&Gs	• small diameter snags remain below S&Gs (20-30yrs) • prescribed or wildfires could result in meeting S&G's much sooner • large diameter snags likely would meet S&Gs
Management Indicator Species (Big Game)				
Hiding Cover by Implementation Unit LRMP Goal is 30%	IU 47	56.6 (%)	56.4 (%)	56.4 (%)
	IU 50	22.5 (%)	22.5 (%)	22.5 (%)
Winter Range LRMP goals is 10% hiding cover and 30% thermal cover	Hiding Cover (%)	14	13	13
	Thermal Cover (%)	17% * however 48% of the land is unsuitable for timber production and a	14	14

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
		risk of continued beetle outbreaks necessitates lowering the thermal cover.		
Open Roads and Motorized Trail Densities LRMP Goal is 2.5 miles/sq mile for summer range and 1-2.5 miles/sq mile for winter range	Summer Range	2.79 miles/sq. mile	2.79 miles/sq. mile	2.75 miles/sq. mile
	Winter Range	4.27 miles/sq. mile *part of this (1.36 miles)are closed with a seasonal road closure	4.27 miles/sq. mile	4.19 miles/sq. mile
Management Indicator Species				
Northern Goshawk	Qualitative Discussion	Some new habitat would develop. Disturbance events may diminish habitat leaving only small isolated pockets of habitat that may or may not support breeding pairs and fledglings.	81 acres left untreated prescriptions would result in open stands that are not susceptible to bark beetle attack for at least 20 years, treatments would benefit goshawks in the long term but would result in a short term reduction in heterogeneity needed by these birds.	Manages the post fledgling area similar to methods described by Youtz et al (2007) see section 2.2.3 and figures 2.7 and 2.8 for stand descriptions
Cooper's Hawk and Sharp-shinned Hawk	Qualitative Discussion	Short term, stands would provide habitat, long term, stands would begin to deteriorate, new habitat development would decrease and habitat potential may ultimately decline.	Short term, habitat would be reduced as trees are thinned and canopies become more open. Long term, more suitable habitat would develop that would tend to be more stable, but the total amount of habitat would remain reduced.	Similar to alt 2 but greater diversity in treatments and reduced area treated would be less detrimental to habitats in the short-term. A larger area would remain more vulnerable to insects and disease
Red-tailed Hawk	Qualitative Discussion	In the short-term individual old growth trees that provide nest trees would diminish due to individual mortality. In the	No nest trees would be affected (>21") Thinning would accelerate the development of larger trees. Project	More areas would be left at a higher density, slowing tree growth, nesting habitat is slower to develop than under alterative 2.

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
		long-term stands would be slow to mature due to over stocking, and nest trees would be incidental due to the lack of LOS that would develop. Suitable nest trees may become more sporadic on the landscape.	disturbances would occur but project design criteria to reduce disturbance are in place.	
Woodpeckers	Qualitative Discussion	Stand replacement fires have the potential to benefit species that use small snags in the short term. Once snags have fallen, new woodpecker habitat would be slow to develop	Species that require large diameter snags would benefit as large snags are not being removed and thinning would accelerate the development of large snags. Salvage logging on 771 acres would remove small diameter snag--negatively impacting species such as black-backed and three-toed woodpeckers. Thinning treatments would have long-term negative effects on snags. Treatment would provide more stable conditions creating smaller patches of habitat on a more frequent basis.	There would be a smaller negative short-term impact on all species because there would be no salvage harvesting. Effects are similar to alt 2 with overall reduction in small snags, greater stability of habitat and development of larger snags preferred by some woodpeckers.
Species of Concern, Birds of Conservation Concern, Land Birds (Discussed by habitat type)	Ponderosa Pine Qualitative Discussion	Stands would remain at increasing risk of a landscape scale stand replacing fire or high levels of bark beetle attacks or both. Tree growth would be slow and LOS would be slow to	Species would benefit from the eventual development of large patches of old ponderosa pine forest with large trees and snags. Main effects of treatment would be from short-term disturbance during	Same as alternative 2

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
		develop.	management activities, and the alteration of habitat by prescribed burns.	
	Lodgepole Pine Qualitative Discussion	Stands are currently in dense, connected stands outside of the HRV. Likely to see a larger stand-replacement fire, which would leave less habitat.	The project would reduce the likelihood of stand-replacement events, which may negatively affect species dependent on the lodgepole pine habitat type. Treatment would result in greater habitat stability through space and time	Same as alternative 2
	Openings, Shrub lands, Meadows Qualitative Discussion	Long-term, pine seedlings would continue to develop, and some of these areas may convert to forest. Alternatively, large stand-replacement events could result in even larger areas of openings, or move these shrub stands to an earlier seral stage with grasses as a potential dominant	With mitigations in place, portions of openings would be retained untreated, and portions would be moved to a different seral stage. This would ensure a stable mosaic of seral stages over time. Logging and fuels treatment activities in the spring and summer may disturb local nesting populations of neotropical migratory birds but are not expected to compromise population viability .	Same as alternative 2
Bats	Qualitative Discussion	Habitat conditions remain unchanged in the short term, long term late old structures would be slow to develop and potential for roost trees and foraging habitat would be limited	Short term, vegetation that provides habitat for prey species such as moths would be reduced by burning and mowing, and individuals may be disturbed during treatment operations, Long term, treatments would be	Effects are the same as those described in alt 2

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
			beneficial to bats by promoting the LOS habitat that would provide foraging and future snags for day roosts	
Soils				
Detrimental Soil Disturbance	Harvest Effects Qualitative Discussion	Wildfires may incur localized detrimental changes to soil chemical, physical and biological properties on 5% of the burned area. No increase in detrimental soil conditions above existing levels without a wildfire event.	Increases in detrimental disturbance are estimated to range from 5 to 15 percent of each unit treated depending on the existing level of disturbance and availability of existing skid trails and landings in each activity area. 19 to 38 acres of detrimental soil compaction across 373 acres of already detrimentally impacted units (table 3.6.3) 2,025 acres would be brought to compaction levels that are near 20%, 3,799 acres would be below 20% compaction after treatment.	No direct effects to the soil resource would occur under Alternative 3 within the 857 unit acres proposed for a salvage prescription (HSV) under Alternative 2.
	Temporary & System Roads Qualitative Discussion	No temporary road building would occur, no changes would be made to Forest Service system roads.	A total of 24 acres of temporary road would be created and decommissioned under this alternative. There would be no change to system roads under this alternative.	Alternative 3 would have the same number and location of temporary roads as described for Alternative 2. This action would rehabilitate approximately 6.5 acres of system roads within the planning area from a detrimentally compacted condition to one capable of infiltrating water and supporting vegetation.

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
	Fuels Treatments Qualitative Discussion	Productivity of the soil resource may decrease in the short term in the absence of wild or prescribed fires that provide a cyclical flush of nutrients in dry forest systems. In the event of a wildfire, localized detrimental changes to soil chemical, physical, and biological properties could occur on up to 5% of the burned area in Flank this would be about 300 acres.	Fuels treatments are expected to result in minimal additional impacts to the soil resource. Mowing is not likely to cause detrimental soil displacement and increases in soil bulk density appear to be inconsequential. Lop and scatter, hand thinning and hand piling treatments are not expected to incur detrimental impacts on the soil resource. Detrimental impacts from prescribed burning and burning landing and grapple piles are expected to be very localized in extent (<1%).	Direct or indirect effects to the soil resource as a result of fuels treatments under Alternative 3 would be the same as those described under Alternative 2.
	Sensitive Soils Qualitative Discussion	Sensitive soils would not be affected as no treatment activity would occur.	The majority of activity areas proposed for mechanical vegetation treatments do not occur on land types that contain sensitive soils. Slopes greater than 30% would be protected by PDC's and mitigation measures. Areas prone to regeneration problems would be protected as stands would remain fully stocked after treatment.	Same as alternative 2
Coarse Woody Debris and Surface Organic Matter	Qualitative Discussion	Coarse woody debris and surface organic matter would increase over time from current levels at a	The proposed harvest activities would reduce potential sources of future CWD by whole-tree	Alternative 3 would meet LRMP standards for soil productivity and comply with the recommended management guidelines that

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
		rate dependent on mortality rates of the stands, as well as natural wind events to move snags to the ground. In the short term, the amount of coarse woody debris and surface litter are likely to increase through natural mortality, windfall, and recruitment of fallen snags over time. High-to-extreme fire hazard and potential for excessive soil heating exists when downed woody debris exceeds 30 to 40 tons per acre	harvesting and yarding material from the site. However, thinning prescriptions would leave sufficient numbers of live trees per acre from which a few per acre could potentially become snags and/or CWD through natural mortality or wind throw.	ensure adequate retention of snags, coarse woody debris, and fine organic matter following both harvest and fuels treatments.
Botany				
Invasive Plants	Qualitative Discussion	Provides the most protection to limit invasive species establishment	Weeds or seeds may enter the project area on equipment. Cleaning of equipment would reduce, but not eliminate the risk of weed establishment.	Effects are the same as those listed for alternative 2
Threatened, Endangered, and Sensitive Species	Qualitative Discussion	No threatened, endangered or sensitive plants are present, no high-probability habitat exists in the project area.	No effects to threatened, endangered and sensitive species	No effects to threatened, endangered and sensitive species
Range				
Range	Qualitative Discussion	Vegetation and forage production would diminish over time. Canopy closure would increase and forage species would decline, reducing the availability of forbs, grasses and shrubs	Project implementation would be beneficial over the long term, due to increased forage production, Status of existing roads would not be changed.	Project implementation would be beneficial over the long term, due to increased forage production, Some roads would be closed and decommissioned.

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
		for browse.		
Recreation				
OHVs and Dispersed Recreation	Qualitative Discussion	Recreation opportunities would remain relatively unchanged. No existing OHV trails or routes, facilities, structures, or infrastructure within the EFR OHV area would be impacted by vegetation or fuel reduction activities.	Temporary loss of available trail mileage managed for ATVs and motorcycles. This could also result in an increased use of other OHV trails that are part of the managed OHV System but outside of the proposed project boundary. Removal of vegetation could result in increased unauthorized use such as traveling off designated routes. Vegetation treatments would likely have a short-term (3 to 10 years) effect to the visual quality of the treatment areas adjacent to dispersed campsites	None of the roads within the EFR boundary proposed for closure or decommissioning are designated routes or trails open to OHV use. Vegetation treatments would likely have a short-term (3 to 10 years) effect to the visual quality of the treatment areas adjacent to dispersed campsites. 8 miles of roads are proposed for closure and would minimally reduce driving opportunities for access to dispersed sights, and sightseeing . Most road closures are not heavily used or are not necessary for administration. Most dispersed campsites within the planning area would not be impacted.
Engineering (Roads)				
Add 6” aggregate	Miles	0	12.9	12.9
Spot surface	Miles	0	3.23	3.23
Grade & restore drainage	Miles	0	25.97	25.97
Block entrance sites	Sites	0	3	3
Closure	Miles	0	2.3	2.3
Decommissioning	Miles	0	4.0	4.0
Economic Analysis				
Discounted Costs	$	0	-$337,912	-$332,085
Discounted Benefits	$	0	$93,794	$89,621
Net Present Value	$	-$100,000	-$3,027,493	-$4,326,296
Cost/Benefit Ratio (gross value/ associated costs)	$	0	0.03	0.03
Volume	MMBF	0	14.5	14.2
Jobs Maintained or Created	Jobs	0	139	136
Estimated Employee Income (jobs created * avg salary for	$	0	$4,421,729	$4,326,296

Activity or Resource Area	Units	Alt 1	Alt 2	Alt 3
lumber and wood products jobs)				

Chapter 3. Existing Conditions & Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

3.1 Past, Present & Reasonably Foreseeable Future Activities

The cumulative effects discussed in this section include an analysis and a concise description of the identifiable present effects of past actions to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for action and its alternatives may have a continuing, additive, and significant relationship to those effects. The cumulative effects of the proposed action and the alternatives in this analysis are primarily based on the aggregate effects of the past, present, and reasonably foreseeable future actions. Individual effects of past actions are not listed or analyzed, and are not necessary to describe the cumulative effects of this proposal or the alternatives.

The cumulative effects analysis in this document is consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008) which states, in part, "*CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions…The agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects."*

3.1.1 Analysis Scales

There are seven major analysis scales of interest for this environmental assessment. The scales of analysis for this document include:

- Deschutes County (1,955,200 acres) compromises the largest analysis scale and is used in the to analyze economic efficiency and environmental justice.
- Two 5th field watersheds (Lower Dry River and Upper Dry River, collectively 480,640 acres) are used to analyze fire & fuels effects.
- The 6th field subwatershed for this project include Hunter Butte, Horse Ridge, and Tepee Draw which cover 71,718 acres and are used to analyze many wildlife species and features including snags, coarse woody material and green tree retention areas; northern goshawk, sharp-shinned hawk, red-tailed hawk, woodpeckers, species of concern, birds of conservation concern, land birds and bats.
- The wildlife implementation units 47 and 50 cover 62,364 acres and are used to analyze mule deer hiding cover in summer range, as directed in the forest plan.
- Tepee Draw Winter Range Habitat Unit is used to analyze effects to hiding and thermal cover for mule deer.
- The Flank project covers 5,824 acres and is used to analyze a variety of resource areas including the historic range of variability; invasive plants; threatened, endangered and sensitive plants; range; recreation (OHV and dispersed); roads; and heritage resources. Over 97% of the planning area would be treated with either vegetation management prescriptions and/or fuels treatments and, as a result, this is an effective scale for resources who's effects are limited to the actual treatment area.

- The 5688 acres of actual units is the smallest analysis scale used in this analysis. Resources analyzed at the stand level include stand resistance to insects, stand resistance to fire, mistletoe, detrimental soil disturbance, coarse woody debris and surface organic matter.

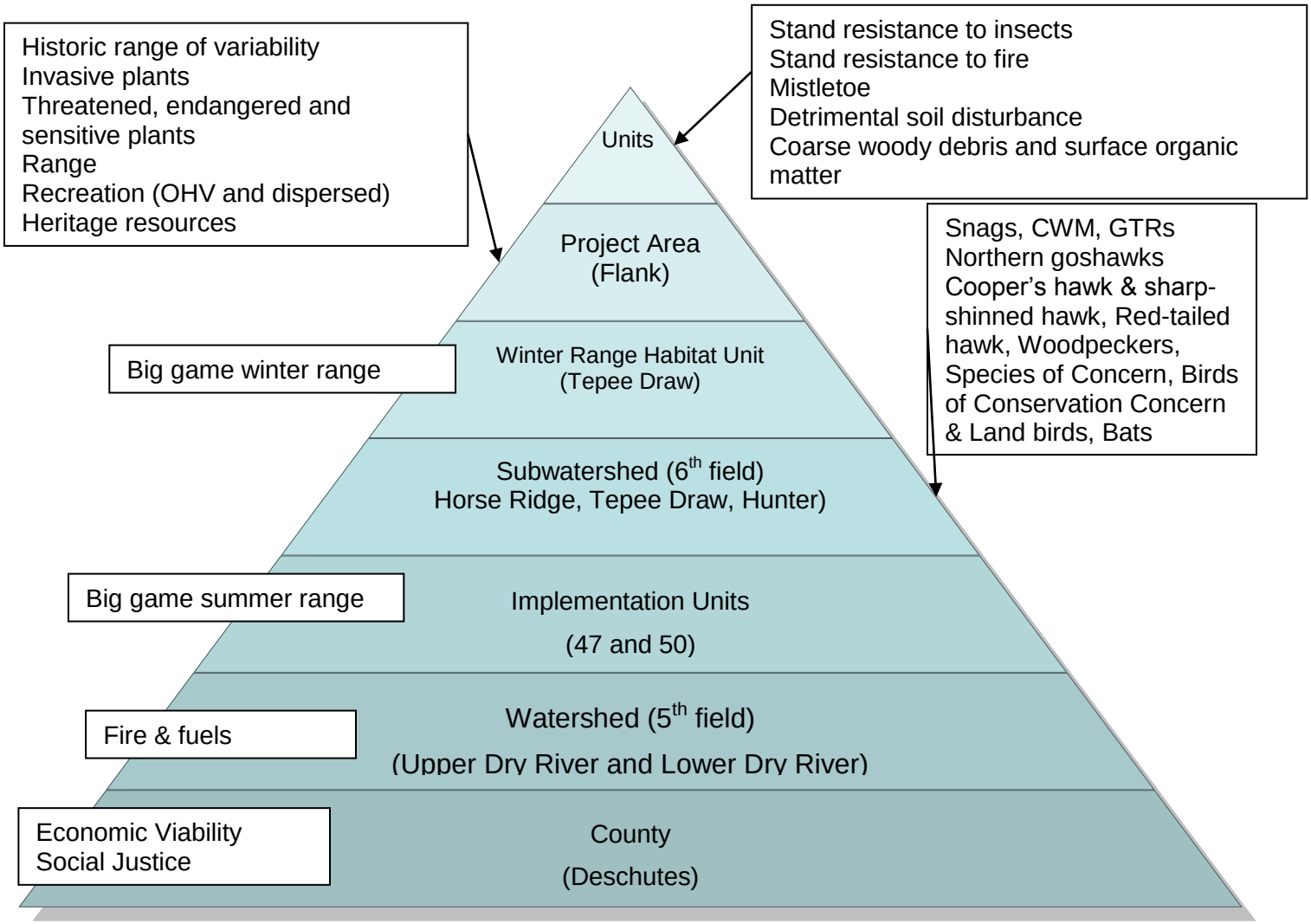


Figure 3.1 Analysis Scales

Areas of analysis are listed for each scale referenced in chapter 3, cumulative effects sections. Table 3.1 lists past, present and reasonably foreseeable future actions that were considered in cumulative effects analysis

Table 3.1 Relevant Past, Present and Reasonably Foreseeable Future Actions

Activity	Year	Acres	Time
Clearcut in the project area	1971-1992	36	Past
Final Removal in the project area	1985-1986	184	Past
Overstory Removal in the project area	1988	135	Past
Partial Removal in the project area	1981	67	Past
Salvage in the project area	1990-1997	174	Past
Commercial Thinning in the project area	1985-1992	1,954	Past
Reforestation in the project area	1984-2002	160	Past
Precommercial Thinning in the project area	1971-2002	3514	Past
Skeleton Fire (northeast of Flank)	1966	17,789	Past
Evans West Fire (northwest of Flank)	1996	4,230	Past
Paulina Fire (southwest of Flank)	1988	12,982	Past
Woodside Ranch Fire (northwest of Flank)	2007	589	Past
18 Fire (northwest of Flank)	2003	3,800	Past
Cave Fire (northwest of Flank)	2005	652	Past
15 small fires inside the Flank area	2000-2010		Past
Opine project implementation	Ongoing		Present
OHV trail use inside and adjacent to the project area	Ongoing		Present
Firewood cutting in the Taghum firewood area affects units: 11-15, 19-22, 29-34, 36, 50, 81	Ongoing		Present
Maintenance of 2 wildlife guzzlers	Ongoing		Present
Grazing in the Cindercone Allotment	Ongoing		Present
Fence Maintenance	Ongoing		Present
Waterset development and maintenance	Ongoing		Present
Site prep for natural regeneration in “Ina” sale	2010		Future
Travel Management Rule implementation	2010		Future

Past activities listed here created current forest structure and associated wildlife habitat. These past activities can be considered in some cases analyzed by describing the current condition.

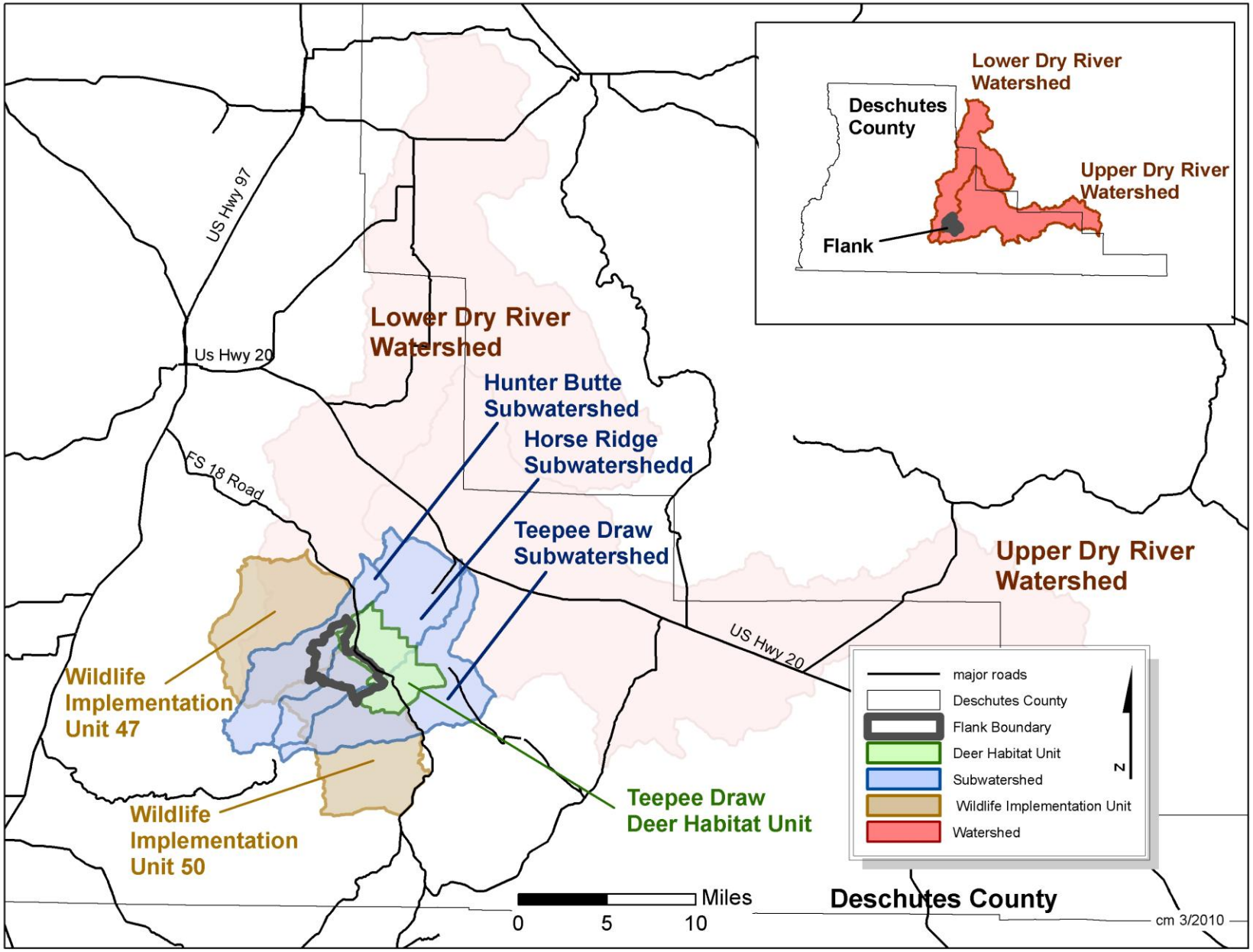


Figure 3.2 Flank Project Analysis Scales

Transportation System Maintenance

Annual maintenance would occur in the future. Forest Service system roads receive annual maintenance in accordance with established road management objectives. Road maintenance work includes activities to reduce brush, clean out drainages, and repair road surfaces on many of the key and secondary roads in the project area (Deschutes Roads Analysis, 1990).

3.1.2 Potential Post Sale Resource Enhancement Projects

Depending on the amount of available funding that may result from the sale of timber off the Flank project, any number of the following resource enhancement projects could be implemented. Post sale projects are not intended to offset other effects of the Flank project. If monies are generated by the Flank timber sale, these projects would be the first to be implemented. Post sale resource enhancement projects are listed in Appendix D.

3.2 Vegetation

3.2.1 Introduction

Stand resistance to insects, specifically bark beetles, is mostly related to tree vigor and density. The amount of moisture allowed for a stand must be apportioned to all the plants and trees growing on a site. The lower the moisture levels in a stand for the same tree density the less resistance to insects attack and mortality. Plant associations indicate the level of moisture and soil depth. This helps identify the tree stocking levels which are not susceptible to beetle mortality (Cochran 1994). Mistletoe infection in stands has been observed to increase stand susceptibility to bark beetle mortality (Conklin 2000). Competition especially between trees is identified through stand density.

The historic range of variability (HRV) is based on a large landscape level. While any individual stand may be within the historic range of conditions on the landscape the amount the area which currently matches the conditions historically present is the basis of comparison. Within different plant associations the historic condition would have been different. This analysis tries to identify the ranges of condition which may have occurred and not just a snap shot at one time. Historic condition of the vegetation can be classified with four main identifiers. The four identifiers are average tree age or size, stand density, species composition and fuel loading (Youngblood, 2004). The tree size or age and density have been aggregated into definitions of structure. Structure has been defined in the Eastside Screens into seven levels. The seven levels are 1)stand initiation, 2)stem exclusion open canopy, 3)stem exclusion closed canopy, 4)understory reinitiation, 5)multi-stratum without large trees, 6)multi-stratum with large trees and 7)single stratum with large trees. Definitions for the seven structural stages are in table 3.2.2.

Stand resistance to fire mortality at the tree level is a function of species composition, stem diameter and crown height. Within the Flank planning area the tree species of note are lodgepole and ponderosa pine. Lodgepole pine is not resistant to fire due to thin bark in all tree sizes and ages. Ponderosa pine increases in fire resistance with diameter and age. Both species have reduced crowns due to competition.

Increase from mistletoe infections in stands have increased in area and intensity from historical conditions. This is due to the increased stocking levels, stands with overstory infections and close proximity of infected trees to uninfected trees. Each of these characteristics are more apt to facilitate spread and increase in intensity of mistletoe infections (Hawksworth 1996).

3.2.2 Regulatory Framework—Vegetation

- Deschutes National Forest Plan land management allocations: MA7, MA8
- Deschutes National Forest Plan standard and guidelines: FH-1, 3; M7-5; M7-10; M8-27; M8-2, 9, 15, 18, 19, 25, 26, 27; TM-4, 10, 32, 43, 48, 49, 50, 63, 67; WL-9, 54, 55, 56, 57, 58, 59, 60, 72, 73
- USFS (USDA Forest Service) 1995. Regional Forester's Forest Plan Amendment #2: Revised Interim Standards for Timber Sales on Eastside Forests. Region 6 Portland, Oregon "East Side Screens"

3.2.3 Analysis Methods—Vegetation

Analysis Methods – Stand Resistance to Insects

Stand Resistance to insects, specifically bark beetles, is mostly related to tree vigor and density. Plant associations indicate the level of moisture and soil depth. This helps identify the tree stocking levels which are not susceptible to beetle mortality (Cochran 1994). Mistletoe infection in stands has been observed to increase stand susceptibility to bark beetle mortality (Conklin 2000). Stand Density Index (SDI) and Basal Area (BA) are two methods for comparing the stand density on a site. SDI values and basal area ranges for each plant association above which beetle mortality or outbreak may occur are shown in Table 3.2.1 as upper management zone (UMZ) and the lower level where trees are still occupying the site potential is identified as the lower management zone (LMZ).

Lower management zone (LMZ) is where trees are still occupying the site. Upper management zone (UMZ) is the density, above which, beetle mortality or outbreak may occur.

Table 3.2.1 Plant Associations and SDI Upper Management Zones

Plant Association Group	Plant Association	Plant Association code	Flank Acres	Upper Management Zone SDI /**BA***	Lower Management Zone SDI/ **BA**
Lodgepole Pine	Bitterbrush/ Needlegrass	CLS2-11	174	105/**52-65**	70/**36-43**
	Bitterbrush/ Fescue	CLS2-14	15	137/ **71-83**	92/**47-56**
Mixed Conifer	Snowbrush-manzanita	CWS1-12	4	143/ **74-87**	96/**50-58**
Ponderosa Pine	Bitterbrush/ Fescue	CPS2-11	4,846	115/ **60-70**	77/ **40-47**
	Bitterbrush/ Needlegrass	CPS2-12	28	111/ **57-67**	74/ **38-45**
	Bitterbrush – Manzanita/ Fescue	CPS2-17	757	124/ **64-75**	83/ **43-51**

From Booser & White undated basal area ranges 8-16 inch DBH

Stands identified from photo interpretation (PI) data with more than 20% total crown closure were selected as stands which were above the UMZ for ponderosa pine and susceptible to beetle mortality. Within the Flank Area more than 63% of ponderosa pine areas are susceptible to bark beetle mortality. In order to predict the effect of treatments data collected in stand exams during 2007 and 2008 were manipulated in the Forest Vegetation Simulator (FVS).

Table 3.2.3 displays the current stratification of structure within the Flank area compared to the HRV. This was not done by plant association as there is less than about 3% of the planning area (140 acres) in the Lodgepole pine plant association group.

Analysis Methods – Historic Range of Variability (HRV)

The analysis would compare the historic range, and the trajectory of stand development over time. Historic condition of the vegetation can be classified with four main identifiers. The four identifiers are average tree age or size, stand density, species composition and fuel loading (Youngblood, 2004). The tree size or age and density have been aggregated into definitions of structure. Structure has been defined in the Eastside Screens into seven levels. The seven levels are 1)stand initiation, 2)stem exclusion open canopy, 3)stem exclusion closed canopy, 4)understory reinitiation, 5)multi-stratum without large trees, 6)multi-stratum with large trees and 7)single stratum with large trees. Definitions for

the seven structural stages are in table 3.2.2. Land survey notes from the original surveys of the area between 1880 and 1900 and modeling of biophysical settings (Bps) were used to compare current conditions to reference conditions. The HRV for the Bps was done for ponderosa pine woodland and savannah in the Brothers Wildfire Use Plan (USDI 2007). Aerial photos and a process described in Forest Data Incorporated, 2001 was used to identify existing structural stages.

Analysis Methods – Stand Resistance to Fire

Stand level resistance would be measured by the average diameter of a stand. Stand species composition would not be evaluated here since the area affected by lodgepole removal is already dealt with in the resistance to insects section of this report. Ponderosa pine, with diameters greater than 8 inches diameter, are resistant to fire mortality with flame lengths up to 4 feet. Ponderosa pine with diameters of 14 inches and greater are resistant to mortality from 8 foot flame lengths. (USFS 2009).

Analysis Methods – Mistletoe

Mistletoe is measured for individual trees on a scale of one to six as prescribed by Hawksworth mistletoe rating system (Hawksworth 1977). The System divides the tree crown into thirds with a rating of one to three for each third. The ratings for each third are added for the individual tree rating. Stand level analysis uses two systems, one to identify the overall stand infection level which is the Dwarf Mistletoe Rating (DMR) and the other is to identify the stand infection intensity the Dwarf Mistletoe Intensity (DMI). DMR is an average of the whole stand infected and uninfected trees. DMI is the average of ratings for infected trees only. A DMR rating of two or greater or a DMI rating of three or greater would cause more growth loss than desired as identified in the Forest Plan.

Table 3.2.2 Structural stages for use with Historic Range of Variability (USFS 1995)

Label	Structural Stage Definition	Description
1	**Stand Initiation** Growing space is reoccupied following a stand replacing disturbance, typically by seral species.	One canopy stratum, one dominant cohort of seedlings or saplings. Grass, forbs, or shrubs may also be present with early seral trees
2	**Stem Exclusion Open Canopy** Occurrence of new tree stems is excluded(moisture limited). Crowns are open grown. Canopy is discontinuous. This structure can be maintained by frequent underburning or management	One discontinuous canopy stratum. One cohort of trees. New tree stems excluded by competition. Trees may be poles or of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
3	**Stem Exclusion Closed Canopy** Occurrence of new tree stems is excluded (light or moisture limited). Crowns are closed and abrading.	Canopy layer is closed and continuous. One or more canopy strata may be present. Lower canopy strata, if present, is the same age class as the upper stratum. Trees may be poles or of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
4	**Understory Reinitiation** A second cohort of trees is established under an older typically seral, overstory. Mortality in the overstory creates growing space for new trees in the understory. Large trees are uncommon.	The overstory canopy is discontinuous. Two or more canopy layers are present. Two or more cohorts of trees are present. Overstory trees may be poles or of small or medium diameter. Understory trees are seedlings, saplings or poles.
5	**Multi-stratum, without large trees** Several cohorts of trees are established. Large overstory trees are uncommon. Pole, small, and medium sized trees dominate.	The overstory canopy is discontinuous. Two or more canopy layers are present. Large trees are uncommon in the overstory. Horizontal and vertical stand structure and tree sizes are diverse. The stand may be a mix of seedlings, saplings, poles, or small or medium diameter trees.
6	**Multi-stratum, with large trees** Several to many cohorts and strata of trees are present. Large trees are common.	The overstory canopy is broken or discontinuous. Two or more canopy layers are present. Two or more cohorts of trees are present. Medium and large sized trees dominate the overstory. Trees of all sizes may be present. Horizontal and vertical stand structure and tree sizes are diverse.
7	**Single-stratum, with large trees** A single stratum of large trees is present. Large trees are common. Young trees are absent or few in the understory. Park-like conditions may exist.	The single dominant canopy stratum consists of medium sized or large trees. One or more cohorts of trees may be present. An understory may be absent or consist of sparse or clumpy seedlings or saplings. Grasses, forbs, or shrubs may be present in the understory.

3.2.4 Existing Condition—Vegetation

Existing Condition – Insects and Disease

Blackbark stands since being established in the 1920s and 30s have either been managed or not. The stands, which have not been managed, tend to be dense stands of poles with heavy fuels from beetle mortality. The fuels are mostly lodgepole pine from previous infestations; however ponderosa pine mortality is becoming more common due to tree stress. Managed stands of ponderosa pine have been precommercially or commercially thinned and are now 60 – 130 square feet of basal area. These stands have responded to lower stocking levels with increased growth, crown volume and understory tree and brush establishment. However, most of these stands still contain lodgepole pine and are above the UMZ.

Stocking levels and species mix leave the stands susceptible to beetle attack. Typically mountain pine beetle attacks on trees greater than 8 inches and less than 16 inches in diameter Mountain pine beetle generally would be quite a bit less of a mortality agent for trees greater than 16 inches dbh and in these diameters typically only in lodgepole pine.
However if lodgepole pine is in stands of ponderosa pine all size trees and both species can be affected by emerging mountain pine beetles. Dense stands of ponderosa pine blackbark trees are susceptible to mountain pine beetle with or without lodgepole pine present. The mortality in these conditions would include the largest trees in the stand thus lengthening the time before large trees dominate the landscape.

Currently mountain pine beetles are infecting stands and causing mortality throughout the Flank planning area. This impact is occurring in lodgepole pine, ponderosa pine and mixed lodgepole and ponderosa pine stands. As shown in figure 3.2.1 aerial detection surveys from 2005 through 2009 identified 2000 acres of bark beetle impact. From the aerial surveys beetle impact in 2005 totaled 86 acres and has increased steadily since then to 1,100 acres with active beetle mortality in 2009. Field visits to the Flank area identified 51% of the stand acres with some level of beetle mortality. The same visits identified that 57% of the stand area visited had some stocking of lodgepole pine. 69% of the area visited in the Flank area had beetle mortality and/or lodgepole pine present in the stand. These two factors identify a large part of the planning area with risk to mortality from bark beetles.

Existing Condition – Historic Range of Variability

The current structure analysis shows no Late Old Structure (LOS) within the Flank project area. There are scattered trees and clumps of trees which are larger than 21 inches dbh, however not in stands larger than 10 acres in size. The Region 6 Interim Direction on Late and Old Structure uses 10 acres as a size threshold for counting Late Old Structure (Hopkins 1992). The trees larger than 21 inches diameter tend to be trees left following the harvest in the 1920's by Brooks Scanlon, and typically were less than 14 inches diameter at that time. These trees may have yellow bark and large plate condition similar to old growth, however they also tend to have pyramid crowns and low branches.

Reference Condition –Historic Range of Variability

The Flank area around the time of European settling was dominated by open ponderosa pine stands with large diameter trees. Stands with smaller diameters and dense stocking were few on the landscape. Disease and mortality due to fires or insects were confined to pockets throughout the landscape few larger than a few acres (Agee 1993). The pockets of mortality would eventually become stocked and would eventually fill in with a new cohort. The open pine condition with fire would keep fuels levels and disease levels including mistletoe and bark beetle outbreaks at a low level. Outbreak levels of bark beetles in the 1930's were considered at the start of an outbreak when more than 50-100 trees per square mile were killed (Grant 1939). This level is equivalent to less than one tree per six acres. Higher levels of infestation occurred however they were in pockets and was the reason why sampling and reporting occurred over the section. Open stand conditions allowed for high vigor which

was limited mostly by nutrients and moisture. Stand vigor is tied to beetle mortality resistance and stand sustainability(McDowell, 2003, Kolb, 2007).

Table 3.2.3 (next page) displays the current stratification of structure within the Flank area compared to the HRV. This was not done by plant association as there is less than 4% of the planning area (140 acres) in the lodgepole pine plant association group.

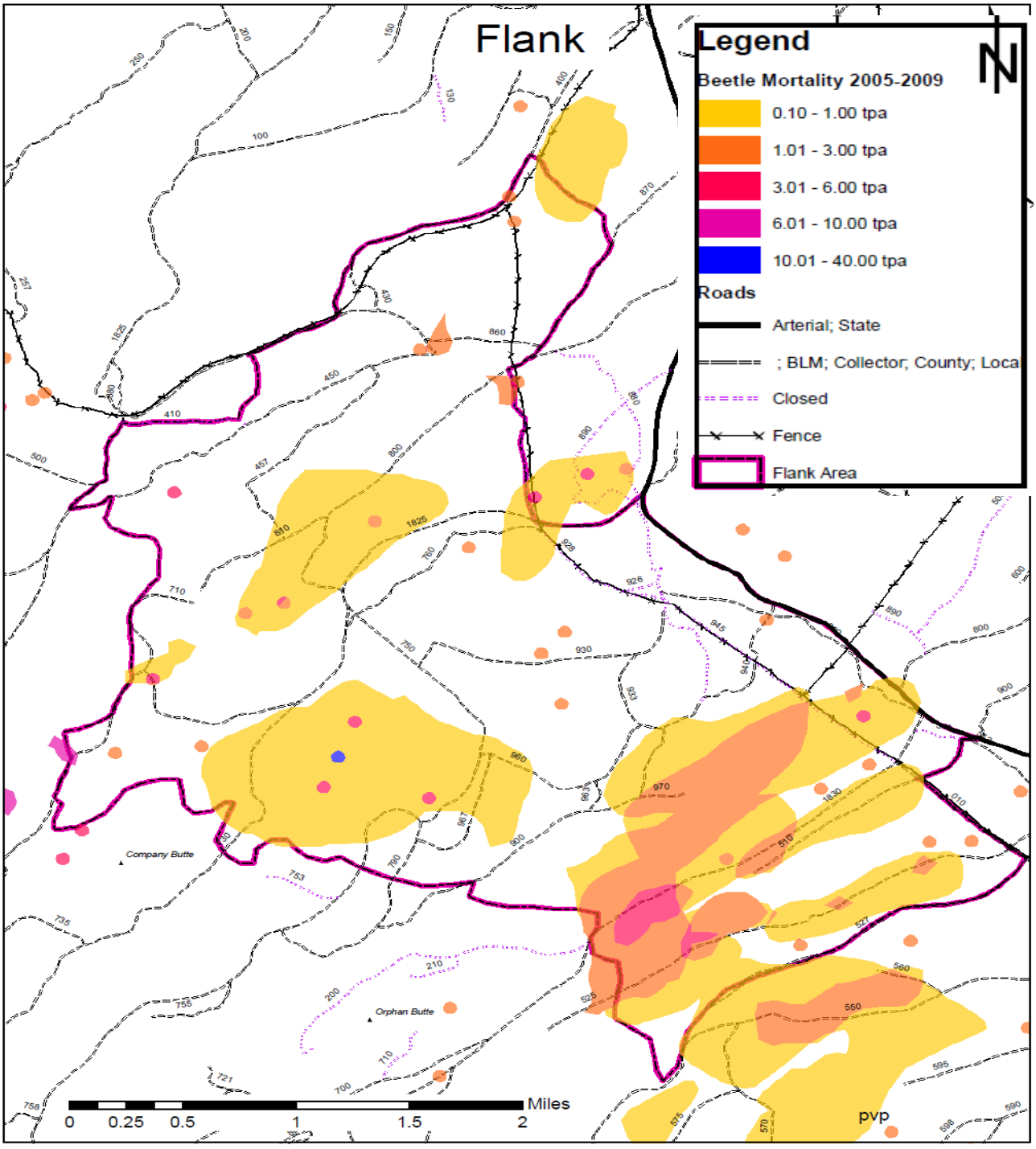


Figure 3.2.1 Aerial Detection Beetle Mortality 2005 - 2009

Table 3.2.3 Biophysical Settings and Expected Structure by Alternative

Structure Description	Acres	Current (Alt 1)	Modeling of Bps	Alt 2	Alt 3
Stand Initiation	203	4%	10 %	4%	4%
Stem Exclusion Open Canopy		0			
Stem Exclusion Closed Canopy	470	8%	5%	8%	8%
Understory Reinitiation	3,448	61%	20%	87%	87%
Multi-story without Large trees	1,560	27%		2%	2%
Multi-story with Large trees	0	0	10%	0	0
Single Story with Large trees	0	0	55%	0	0

There are more than 5,000 acres of blackbark in the planning area. This is about 90% of the area. Blackbark stands which have been thinned are commonly considered understory reinitiation while thick unthinned stands can be considered multi-story without large trees. These two structures dominate the Flank landscape.

Existing Condition – Stand Resistance to Fire

Currently most of the Flank area has accumulated fuels and trees have small average diameters if they have not been thinned. Unthinned stands when modeled in FVS have average diameters of under 7 inches dbh. Stand which are open have average diameters greater than 11 inches dbh. The larger diameters are more resistant to fire mortality (Agee 2005). Analysis on similar areas showed trees resistant to mortality with 4 foot flame lengths with 8 inch diameters, and resistant to 8 foot flame lengths causing mortality if diameters are greater than 14 inches diameter (USFS, 2009). These two thresholds are used in this analysis.

Existing Condition – Mistletoe Spread and Intensity

Mistletoe in the Flank planning area was identified on field review in 15 units representing 588 acres. Seven units had mistletoe in lodgepole pine only. Mistletoe is species specific, thereby allowing reduction of one species of mistletoe by promoting another species of tree. The spread of mistletoe is influenced by species, tree density, and tree canopy layers. The current stands in the Flank project area have one or two tree species, tree densities which are moderate or high, and some have two canopy layers. Each of these factors increases dwarf mistletoe intensity, and distribution. The modeling of mistletoe infected stands shows 3% to 71% of the stand infected and DMI between one and a half and three. The stand average DMR is somewhat low at between 0.1 and 1.0. This reflects the clump distribution of the mistletoe with high intensity in those clumps.

3.2.5 Direct and Indirect Effects—Vegetation—Alternative 1

Direct and Indirect Effects– Insects and Disease –Alternative 1

The existing condition would continue with Alternative 1. Stands sampled range from an SDI level of 145 to 316. These stands tend to have beetle activity in area especially those with densities 175% of the SDI UMZ. The current level of beetle risk would remain the same and the current level of beetle mortality in all size groups of ponderosa pine and lodgepole pine would accelerate. This wide impact of bark beetles can be expected to continue because of high stand densities and the intermixing of lodgepole pine in ponderosa pine stands. Bark beetle mortality would reduce the number of larger overstory trees on the landscape and increase the time it takes for stands to develop large tree structure.

This has the potential to reduce the average diameter of the remaining stands. This would delay the growth of ponderosa pine into larger diameter classes through reduced growth of trees from competition and mortality of larger trees. Modeling of stand exam data identifies that all stands where exams were available were above the upper management zone (Table 3.2.1) and would remain at beetle risk until some form of mortality changes the stand density.

Direct and Indirect Effects – Historic Range of Variability – *Alternative 1*

Alternative 1 the No Action Alternative would leave the same structure mix as is present. Compared to the HRV there is an abundance of understory reinitiation and multi-story without large trees. As shown in table 3.2.3 there is no large open tree structure. This paucity, with the direction from the Eastside Screens indicates, a lack of meeting the objective of managing for large open structure in the long run with this alternative.

The improvement of stands to develop into late old structures of 6 and 7 is dependent on the structures with smaller diameter trees growing from stages 3, 4 and 5. Typically understory reinitiation has a high chance of growing into large structure especially with fire (USDI, 2007). Multi-story without large trees and closed canopy stem exclusion take longer and have the chance of not developing into late old structure due to mortality. The structural stages which are overstocked in ponderosa pine type have a high probability of beetle mortality and reduced diameter growth.

Direct and Indirect Effects – Stand Resistance to Fire – Alternative 1

Alternative 1 would not change the average diameter in the stands. Diameters would increase half as fast as thinned stands. The average diameter of trees in the modeled stands averaged 8.6 inches. This means that at least half the trees are not resistant to fire mortality at the low flame length level of 4 feet. Growth in the untreated stands can be expected to be at or below current rates averaging less than one inch of diameter growth over the next decade (Hall 1987).

Direct and Indirect Effects – Mistletoe Spread and Intensity – Alternative 1

Alternative one would maintain the infection levels of mistletoe at current levels. The stand Level DMR can be expected to be in a range of .1 and 1 and DMI of 1.33 and 2.9. The DMI level above 3 would impact tree growth more than 10%. In the years to come the DMR and DMI would increase due to proximity of uninfected trees with infected trees and overstory trees above desired regeneration infecting understory trees. The highest impact of mistletoe infection is expected in the six stands, where overstory lodgepole pine is infected with mistletoe, and the understory trees are established and expected to stock the stand. Overstory mistletoe, if it has not infected the understory already, can be expected to infect a majority of the trees within a decade. Modeling of the ponderosa pine mistletoe indicates DMR and DMI levels in heavier infected stands reaching the thresholds within about three decades.

3.2.6 Direct and Indirect Effects—Vegetation – Alternative 2 and 3

FVS modeling of growth response to thinning, shows all stands would be below the upper management zone after treatment.

Direct and Indirect Effects– Insects and Disease – Alternative 2 and 3

The action Alternatives 2 and 3 would treat 5,011 and 4,945 acres of the planning area Alternative 3 being 73 acres less with no treatment in unit 54.The thinning of ponderosa pine and lodgepole pine would reduce stocking levels and bark beetle mortality risk. This reduction would allow future growth without becoming at risk to beetle outbreak for over two decades (Figure 3.2.2). This reduced risk is brought about by reducing stand density and removing where possible the lodgepole pine component of ponderosa pine stands. The reduced bark beetle mortality would promote large trees to survive and recruit the larger trees in small diameter stands into the larger diameter groups faster than leaving them alone.

Stands where thinning occurs currently have concentrations of moderate and high risk, but also have areas where within a decade or less they would be at risk. The whole unit except for areas wildlife retention areas would have the density reduced.

Current beetle activity with Alternative 2 and 3 can be expected to be noticeably reduced. The areas mapped with recent bark beetle activity by aerial surveys are areas to be thinned. High density stands were selected for treatment and would be reduced, however 10% of each stand would remain unthinned and remain at risk. Following treatments about 89% of the planning area would have stocking levels at low enough densities to be at low risk to beetle mortality and outbreaks. This is better than the No Action alternative.

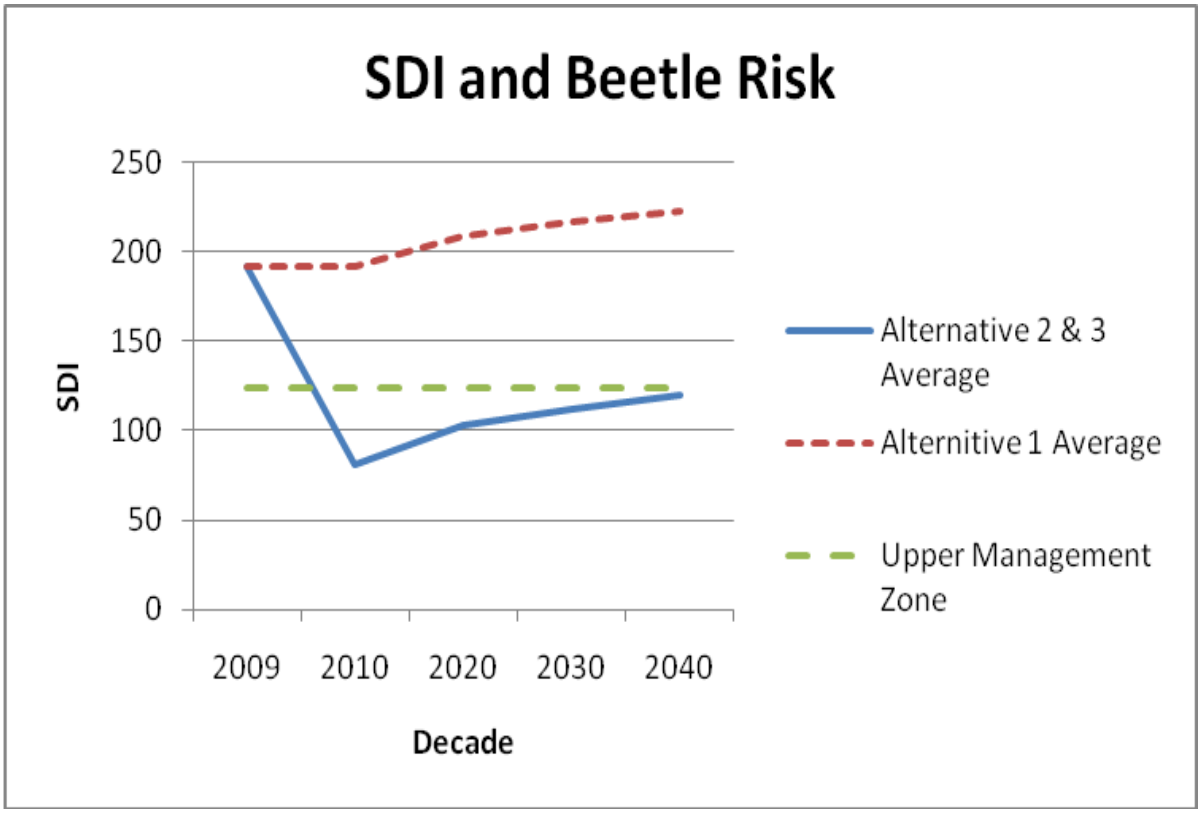


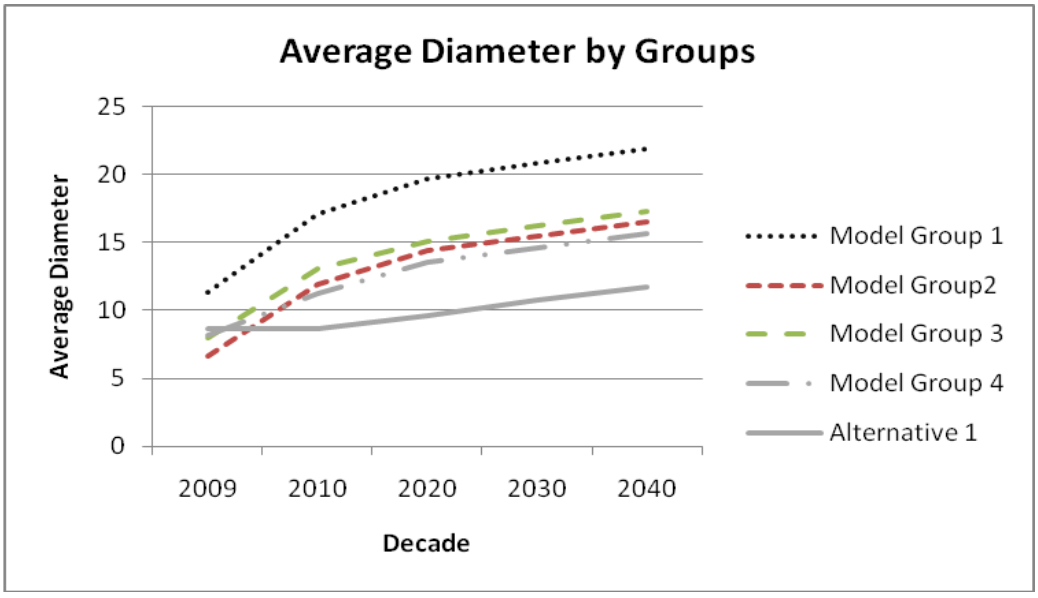
Figure 3.2.2 Stand Density Index Comparison of Alternatives

Enhancement of the lowered beetle risk in ponderosa pine stands would also occur through the removal of lodgepole pine in mixed stands of ponderosa and lodgepole pine. With Alternative 2, stands which were field reviewed and are dominated by ponderosa pine, thinning of 3,715 acres (61%) have been identified where lodgepole pine would be removed. This would reduce the possibilities of ponderosa pine mortality due to beetles attracted to stands with lodgepole pine present.

Some stands are lower through removing more lodgepole pine or mistletoe, while stands with higher SDI values following treatments are due to trees larger than 21 inches diameter making up a portion of the trees left. After two decades 42% of the stands modeled would be above the upper management zone.

Direct and Indirect Effects – Historic Range of Variability – Alternative 2 and 3

The action Alternatives 2 and 3 would move stands towards HRV by managing stands into a condition with more potential to become open ponderosa pine. The largest structure type to shift towards the open condition because of thinning is the dense multi-layer stands (structure 5) which through thinning would become understory reinitiation (structure 4). The increase in understory reinitiation has more potential to become open large pine structure in the future (USDI, 2007). The reduction of stocking levels on all structures increases growth and vigor and reduces mortality potential (Cochran 1994, Spies, 2006). This growth increase has the potential of increasing the area with large diameter trees sooner, as shown in figure 3.2.3. Thinning from below increases the average stand diameter by removing many of the smaller trees. The increase in growth with thinning prescriptions would keep the 10-year growth average above 1.5 inches per decade. Figure 3.2.3 displays typical growth for the different prescriptions and commonly growth above four inches in diameter within the first two decades following treatments (Hall 1987). This increase in average diameter growth is much larger than that for the no action alternative because of the average diameter in that alternative and the level of competition between trees (McDowell 2003).



Model Group 1: open low stocking of ponderosa pine

Model Group 2: dense, unthinned blackbark ponderosa pine

Model Group 3: thinned blackbark ponderosa

Model Group 4: lodgepole pine

Figure 3.2.3 Increase of Tree Diameter by Decade

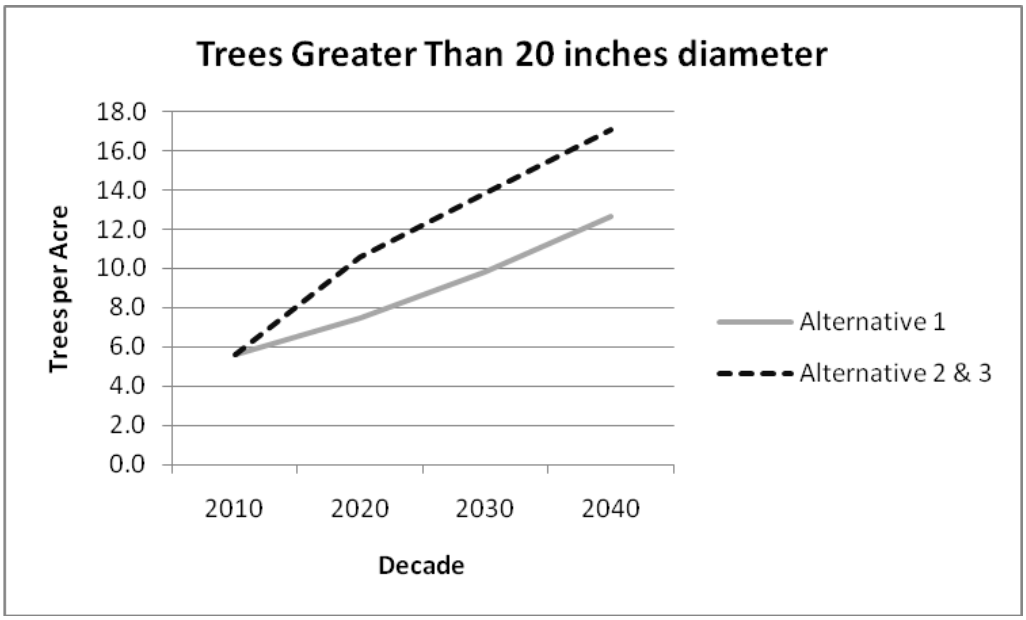


Figure 3.2.4 Large trees per acre by decade

Direct and Indirect Effects – Stand Resistance to Fire – Alternative 2 and 3

Following thinning the average diameter predicted over the project is 13.8 inches diameter. This size group tends to be resistant to fire with 4 foot flame lengths, and half the trees would be resistant to fire mortality at the 8 foot flame length. In thinned stands the growth can be expected to be as high as 2 inches in diameter each decade (figure 3.2.5), which would provide stands with average diameters around 16 inches in a decade. Both action alternatives would leave 10 percent of units untreated, in wildlife retention areas, leaving slow growth and lower fire resistance on some of the planning area. Alternative 3 would also leave stand 54 untreated and dense, leaving it less fire resistant than the surrounding stands. Alternative 3 would also thin two stands wider than the rest allowing faster growth and larger trees.

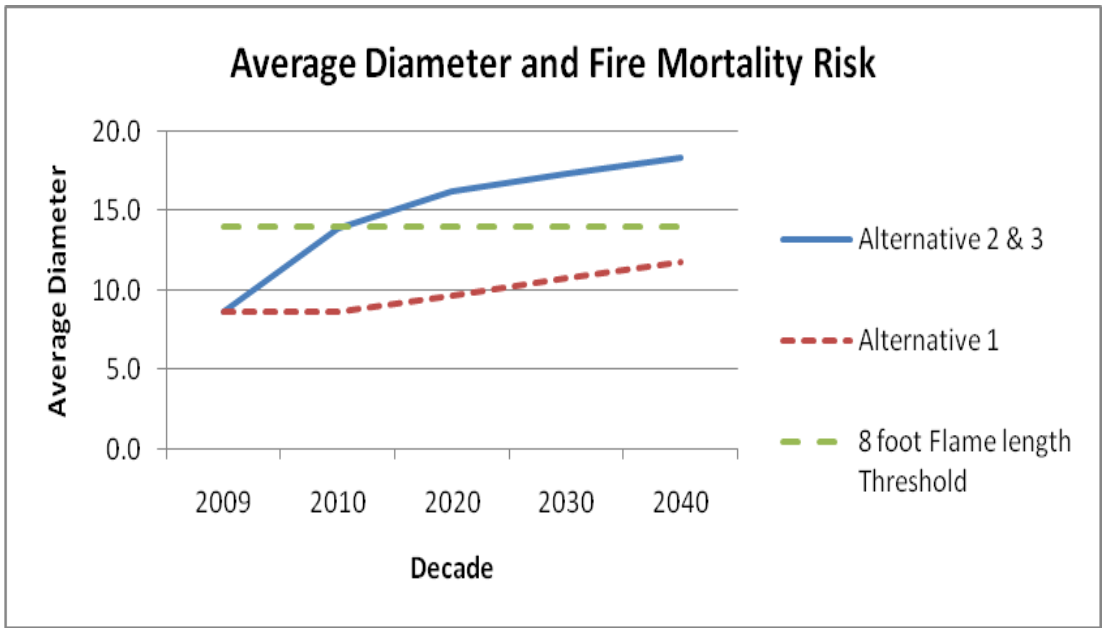


Figure 3.2.5 Stand Diameter and Resistance to Fire

Direct and Indirect Effects – Mistletoe Spread and Intensity – Alternative 2 and 3

Alternative 2 and 3 would have similar effects on mistletoe, except for not thinning in stand 54 which has mistletoe and would not have any reduction in tree spacing or mistletoe infected trees. This is a difference of 74 acres of which only a portion of this stand is infected. Alternative 2 and Alternative 3 would have stocking reduction on 554 acres and 481 acres of stands which may have mistletoe infection. This would allow three main factors for limiting the spread and infection levels of mistletoe: removal of heavily infected trees would reduce the infection intensity, increasing stand spacing would reduce the lateral spread of mistletoe, and reducing two layer component of stands would reduce the vertical spread of mistletoe. Both action alternatives would remove overstory lodgepole pine from over desired understory lodgepole pine on 251 acres. Mistletoe had been positively identified on 194 acres of these stands.

Modeling in FVS shows removal of lodgepole pine dwarf mistletoe in stands where overstory removal of lodgepole pine occurs, this is representative of 194 acres. In ponderosa pine stands the DMI rating went down in one stand and up in another. The rating increase was because of the number of trees left in the stand which were of larger diameter and would not be removed in the thinning. Once the stocking reduction was implemented there were fewer total trees infected left in the stand. The DMR for the stands modeled showed a similar response as the DMI with one stand going down and the other going up (Figure 3.2.6). Again it had to do with the total number of trees infected as a percentage of the stand remaining. In the longer term the stands did not reach the DMR or DMI thresholds of two or three in the three decades modeled. Reducing the overall infection and the worst infections within the stands would also have the effect of reducing mortality from mistletoe and fire (Hawksworth 1997, Hessburg, 2008).

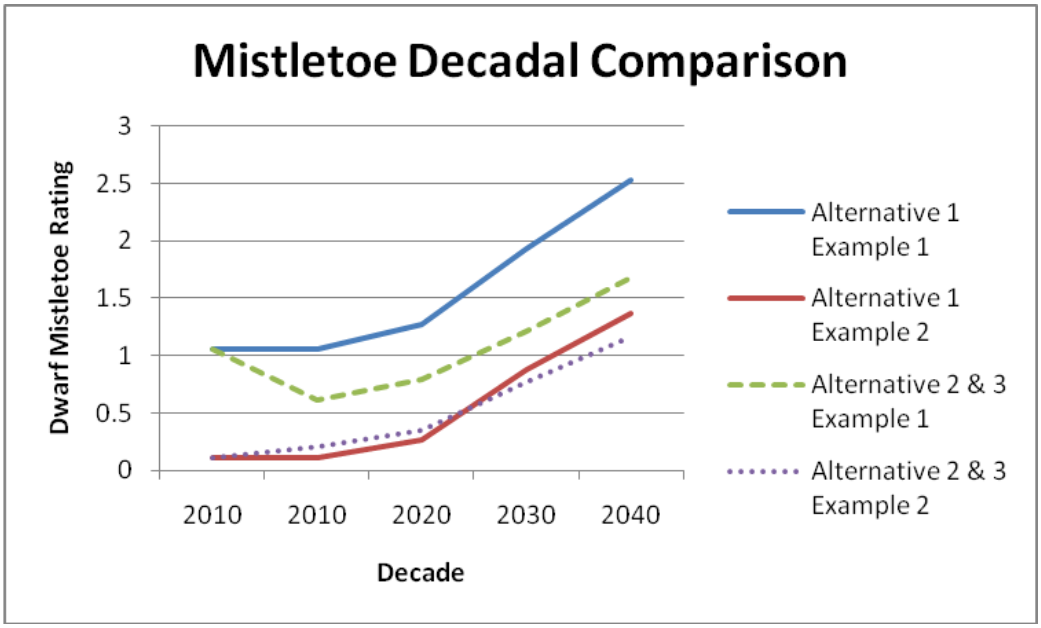


Figure 3.2.6 Mistletoe Rating Over Time

3.2.7 Cumulative Effects—Vegetation

Scope of Analysis

Stand resistance to insects, stand resistance to fire and mistletoe area all analyzed at the stand level. Stand resistance to insects considers bark beetle activity at the stand level. Individual stands can change fire behavior and individual trees can survive or die depending on the three resistance

characteristics of diameter, age and species. Mistletoe infections are increasing in intensity and spreading mostly within specific stands and the effects are relative to individual stands.

Historic range of variability is analyzed across the planning area. The Eastside screens direct using a large landscape where forest types, environmental settings and disturbance regimes are relatively uniform (USFS 1995). The Flank area is and was similar in responses and plant association and weather patterns.

Past, present and reasonably foreseeable future actions listed in table 3.1 were analyzed and considered in conjunction with effects of the Flank project. Both action alternatives meet standards and guidelines described in the Forest Plan for stand resistance to insects, stand resistance to fire, mistletoe, and historic range of variability.

Cumulative Effects – Insects and Disease

There would be no cumulative effects to insect and disease susceptibility as a result of the Flank project when added to past, present and reasonably foreseeable future actions. Beetle impacts would continue throughout the black bark pine and lodgepole pine stands adjacent to the Flank area. However, beetle effects are mostly confined to individual stands except in area where large landscapes are dominated by lodgepole pine in the susceptible diameter classes. The other activities in and around the Flank project would have effects in the landscape on beetle caused tree mortality but not outside their own boundaries.

Cumulative Effects – Historic Range of Variability

There would be no cumulative effects to the historic range of variability as a result of the Flank project when added to past, present and reasonably foreseeable future actions. Adjacent projects to the Flank area would have effects on the HRV of the larger landscape, but not of the stands within the Flank project.

Cumulative Effects – Stand Resistance to Fire

There would be no cumulative effects to stand resistance to fire as a result of the Flank project when added to past, present and reasonably foreseeable future actions. Action alternatives have no effect on adjacent stand or area fire resistance. The fire resistance is relative to each stand and has no cumulative effects from other actions in or outside the planning area.

Cumulative Effects – Mistletoe Spread and Intensity

There would be no cumulative effects to mistletoe spread and intensity as a result of the Flank project when added to past, present and reasonably foreseeable future actions. There would be some reduction in amount of mistletoe infecting understory leave trees left from the Ina project site preparation.

3.3 Fire and Fuels

3.3.1 Regulatory Framework –Fire and Fuels

- The Deschutes National Forest Plan Standards and Guidelines (M7-26 to 28, M8-27)
- Clean Air Act as amended (1990)
- Oregon Smoke Management Plan

3.3.2 Analysis Methods – Fire and Fuels

The following is a list of analysis methods and their uses

- BEHAVE*plus and FLAMMap* software, model expected fire behavior

- Fire Regime condition class (FRCC) framework for evaluating/quantification of stand conditions relative to historic conditions
- Fire Behavior Prediction System Fuel Models (FBPS) standardized fuel models for predicting fire behavior characteristics
- Geographic Information Systems mapping/evaluation of spatial characteristics

3.3.3 Desired Future Condition –Fire and Fuel

The forest plan states that fuels in the Flank area would be kept to 5-12 tons per acre (LRMP 4-115 & 4-120). Fuels would be arranged in such a way that fires can be controlled with ground forces and not heavy machinery or aerial resources. The primary fuel loading size class that contributes to fire behavior are fuels less than three inches in diameter. Large fuels, are acceptable to a certain degree, to provide for soil protection, micro-site benefits, and habitat.

3.3.4 Existing Condition –Fire and Fuels

Within the last ten years there have been fifteen fires inside the Flank EA area. The largest being two acres. Three of these fires (20%) were caused by humans while the remaining twelve fires (80%) were caused by lightning.

Existing Condition—Plant Association Groups

The project area includes three plant association groups (PAGs): ponderosa pine, lodgepole pine, and mixed conifer. Nearly the entire EA area is a homogonous, even-aged, black bark ponderosa pine stand. There are a few trees that are older, after not being harvested in the 1930s because they were considered too small at the time. Regeneration is becoming established in several of the stands. The areas that are lodgepole pine, or mixed conifer, stands are similar age but some lodgepole pine stands are beginning to degrade and/or being attacked by mountain pine beetle. Because there are less than 5 acres of mixed conifer PAGs and all of it lands within the Newberry Fire (1998), which was replanted in lodgepole pine, these acres would be considered part of the lodgepole pine PAGs.

Ponderosa Pine PAGs compose 95% of the area. Ponderosa pine forests are uniquely suited to frequent, low intensity, surface fires. They grow in dry environments with prolonged dry seasons and produce sufficient litter to carry fire almost every year. Fire frequencies range from 5-25 years on most ponderosa pine sites in the Pacific Northwest. Such frequent burning is associated with low-intensity fires because fuel energy on or near the ground is consumed at periodic intervals. The majority of the evaluation area within this PAG is even-aged, single story, at about 90 years of age, in the black bark stage.

Lodgepole Pine PAGs compose 5% of the area. Stand densities are between acceptable, to high, in these PAGs. Bark beetles have attacked the larger trees and killed about half of them. The pole sized trees, and smaller, have not had bark beetle attacks but do have some mistletoe. Historically, fire and mountain pine beetle outbreaks have been the major disturbance mechanisms shaping PAGs in Central Oregon (Hessburg 1994). Mountain pine beetle outbreaks often killed as many as 250 trees per acre, creating enormous quantities of flammable fuels in those areas (Mitchell 1988). Subsequent wildfires destroyed remaining stands, allowing for the regeneration of lodgepole pine. These situations occurred along the west and southwest edges of the project area. The Paulina Fire (1988, 12,592 acres) is an example of the fire portion of this disturbance mechanism.

Fire suppression and the lack of vegetation management activities to address hazardous fuel levels, has contributed to the development of higher stand densities in existing stands with subsequent increases in natural fuel levels. Some stands have further complications by the presence of dwarf mistletoe in overstory, middle story, and understory lodgepole pine. Mistletoe brooms collect litter fall, add to ladder fuel levels, and increase the susceptibility of those stands to crown fire.
Mixed conifer PAGs compose only about 1% of the area and are similar to lodgepole pine PAGs. Fire is a relatively infrequent component in this environment. Historic fire return intervals (pre-fire suppression) were highly variable, ranging from 35-100 years in warmer sites and often in excess of

150 years on cooler sites. In the warmer sites, fires were often intense resulting in stand replacement ranging from 35 to 70 percent of the affected area. In cooler site, fires often resulted in stand replacement over 70 to 100 percent of the affected area (Agee 1990).

Existing Condition – Fire Regimes and Condition Classes

Fire regimes are based on the average number of years between fires combined with the amount of the dominant overstory vegetation replaced by fire. A condition class is a classification that measures the degree of departure from natural or historic fire regime (Hann and Bunnell 2001). Each fire regime has three coarse-scale condition classes: low condition class 1(CC1), moderate (CC 2), and high (CC 3). The fire regime and condition class concept was designed to be used at the landscape scale, not at the stand level.

A condition class is a classification that measures the degree of departure from natural or historic fire regime. This departure results in changes to one (or more) of the following cological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and disease mortality, grazing, and drought) (Hann and Bunnell 2001). Each fire regime has three coarse-scale condition classes: low (Condition Class 1), moderate (CC 2), and high (CC 3). Low departure is considered within the natural (historical) range of variability, while moderate and high departures are outside the historic range of variability.

A fire regime is based on the average number of years between fires combined with the amount of the dominant overstory vegetation replaced by the fire.

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Condition class measures the degree of departure from natural or historic fire regime.

Table 3.3.1 Fire Regimes in the Flank Project Area

Fire Regime	Acres	Percent
I (1-35 year return interval)	5,560	95.5
III (35-100 year return interval)	8	0.1
IV (35-100 year return interval)	240	4.1
Non-vegetated	16	0.3

Table 3.3.2 Condition Classes in the Flank Project Area

Condition Class	Acres	Percent
1 – low	257	4.4
2 – moderate	4,126	70.8
3 – high	1,425	24.5
Non-vegetated	16	0.3

Fire regime I is characterized by short return interval, low intensity fires. These areas are primarily ponderosa pine stands within the Flank EA project area. Though, not a direct correlation, fire regime III is primarily composed of mixed conifer stands and fire regime IV is primarily composed of lodgepole pine stands.

More than 95% of the project area is within condition class 2 or 3. This indicates the majority of the area is outside the natural (historical) range of variability. Depending on which ecological component is affected, the stands become more susceptible to insects, diseases, or fire to return it to the natural (historical) range of variability.

Tables 3.3.1 and 3.3.2 show the percentage of fire regimes and condition classes in the Flank planning area, and the distribution of fire regimes and condition classes within the project area, which is compiled from table 3.3.4. Table 3.3.1 reveals that over 95% of the project area is within fire regime 1. Table 3.3.2 takes each of the condition classes from all fire regimes and compiles them. This shows that less than 5% of the project area is currently within natural historic range of variability. More than 95% of the project area is within condition classes 2 or 3. This indicates the majority of the area is outside the natural (historic) range of variability. Depending on which ecological component is affected, the stands become more susceptible to disease, insects, or fire.

Existing Condition – Fire Behavior

Fuel loading and type partially determine fire behavior. Three types of fuels affect fire behavior: fine fuels such as grass, forbs, or needles; small woody fuels less than three inches in diameter – both live and dead; and large woody fuels greater than three inches in diameter. Fine fuels and small woody fuels are the major contributors to fire spread rates by carrying the ignition and flaming front of a fire (Rothermel 1983). Small woody fuels influence the rate of spread and fire intensity (Agee 1993). Large fuels do not contribute greatly to fire spread, though they do remain burning after the fire front has passed (Andrews, 1986) and contribute to fire duration, fire residency, and fire severity.

Ladder fuel levels have increased due to the growth of understory trees and shrub layer in many areas. Further enhancing ladder fuel levels in some areas is the presence of dwarf mistletoe. The mistletoe brooms collect litter fall, increasing ladder fuel levels. While the Flank area is not currently susceptible to crown fire behavior under typical summer weather conditions. If left untreated, crown fire susceptibility would increase and eventually fuels in the area would permit rapid crown fire development during wildfire events. Currently, single trees, or groups of trees, would torch from fire climbing ladder fuels and burning the canopy. This activity has a high potential of casting burning embers ahead of the fire, creating spot fires.

Wildland fires with flame lengths greater than four feet generally require mechanized equipment and/or aerial retardant drops to be effective. This type of fire is too intense for direct attack using hand crews.

Fire behavior potential is interpreted by the use of fire behavior models (Rothermel 1972, Albini 1976). Of the 13 models, 6 are present within the project boundary. Table 3.3.3 shows expected fire behavior by fuel model, that is expected to result from each fuel model. BEHAVE (Andrews 1986) and FLAMMAP (Finney 2006) were used to model the expected fire behavior for the 90th percentile weather for fuel models located in the project area. The 90th percentile weather is used for conditions for a problem fire as the 97th percentile weather conditions are almost identical. The Fire and Fuels report on file at the Bend/Fort Rock Ranger Station compares the 90th and 97th percentile weather conditions.

Table 3.3.3 Fire Behavior Potential by Fuel Model

Fuel Model	Description	Expected Fire Behavior	Acres	90th Percentile Weather	
				Rate of Spread (ft/min)	Flame Length (ft)
1	Grassland	Moderate	19	297	7.5
2	short grasses in open pine stands	High/Extreme	66	131	11.8
6	dormant shrubs	High/Extreme	5,306	90	10.0
8	compact conifer litter layer with little or no undergrowth	Low	343	6	1.8
9	long-needle pine litter	Moderate	15	28	5.2
10	closed canopy stands with heavy dead/down woody fuels	High/Extreme	59	28	9.2
Non-forested	NA	N / A	16	None	None

Fuel model 6 dominates the project area but there are scattered patches of fuel model 8. Fuel models 1, 2, 9, & 10 are mainly on the west side of the planning area in small patches. The exclusion of fire across all fuel models has resulted in an unnatural accumulation of fuels. This has resulted in shifts in fuel models, toward fire behaviors of moderate or high/extreme. During the summer, most winds have a westerly component to them. The 97th percentile weather has an average wind speed of 9 MPH with gusts as high as 12 miles per hour (Data collected from Camp 2 RAWS station).

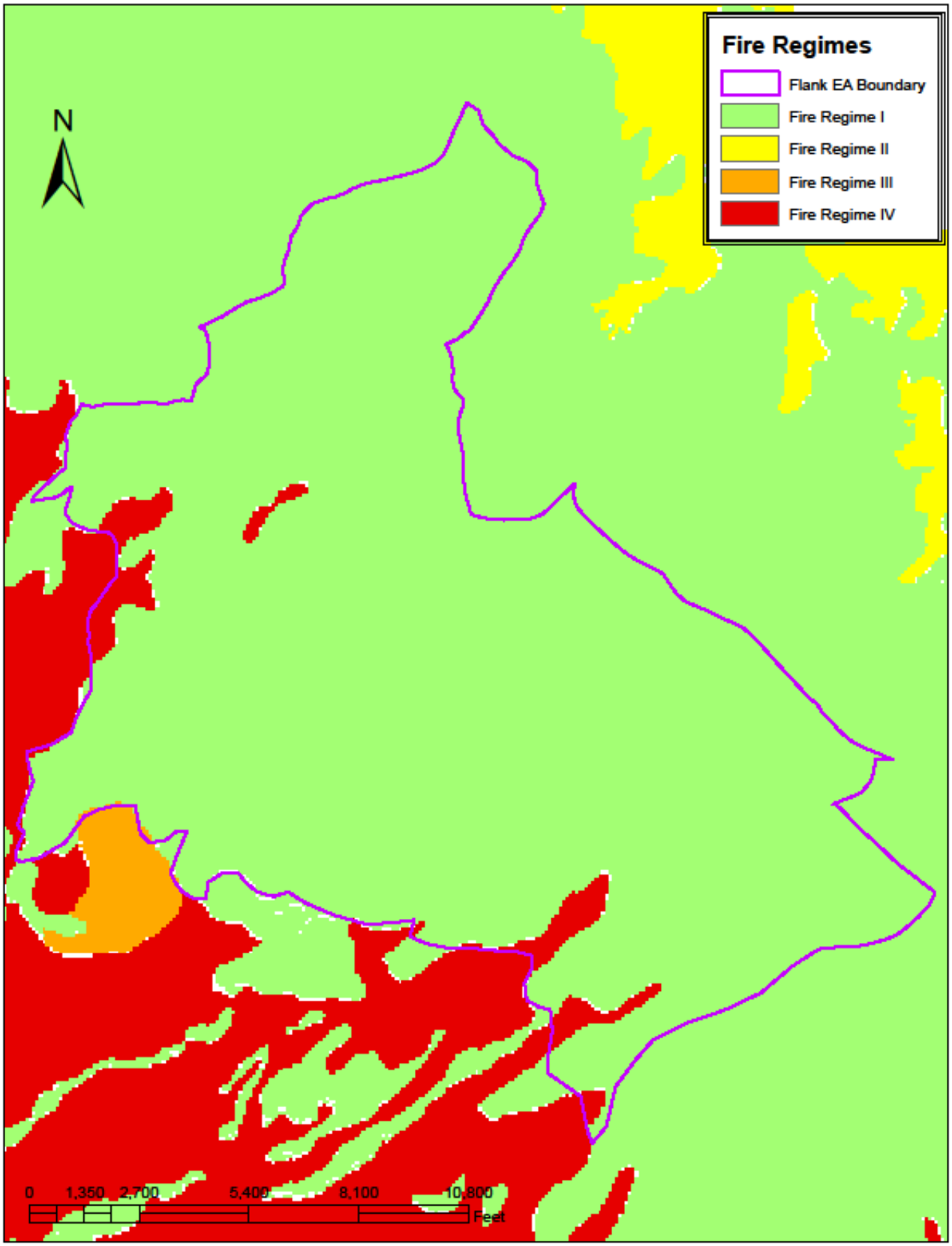

Figure 3.3.1 Fire Regimes in the planning area

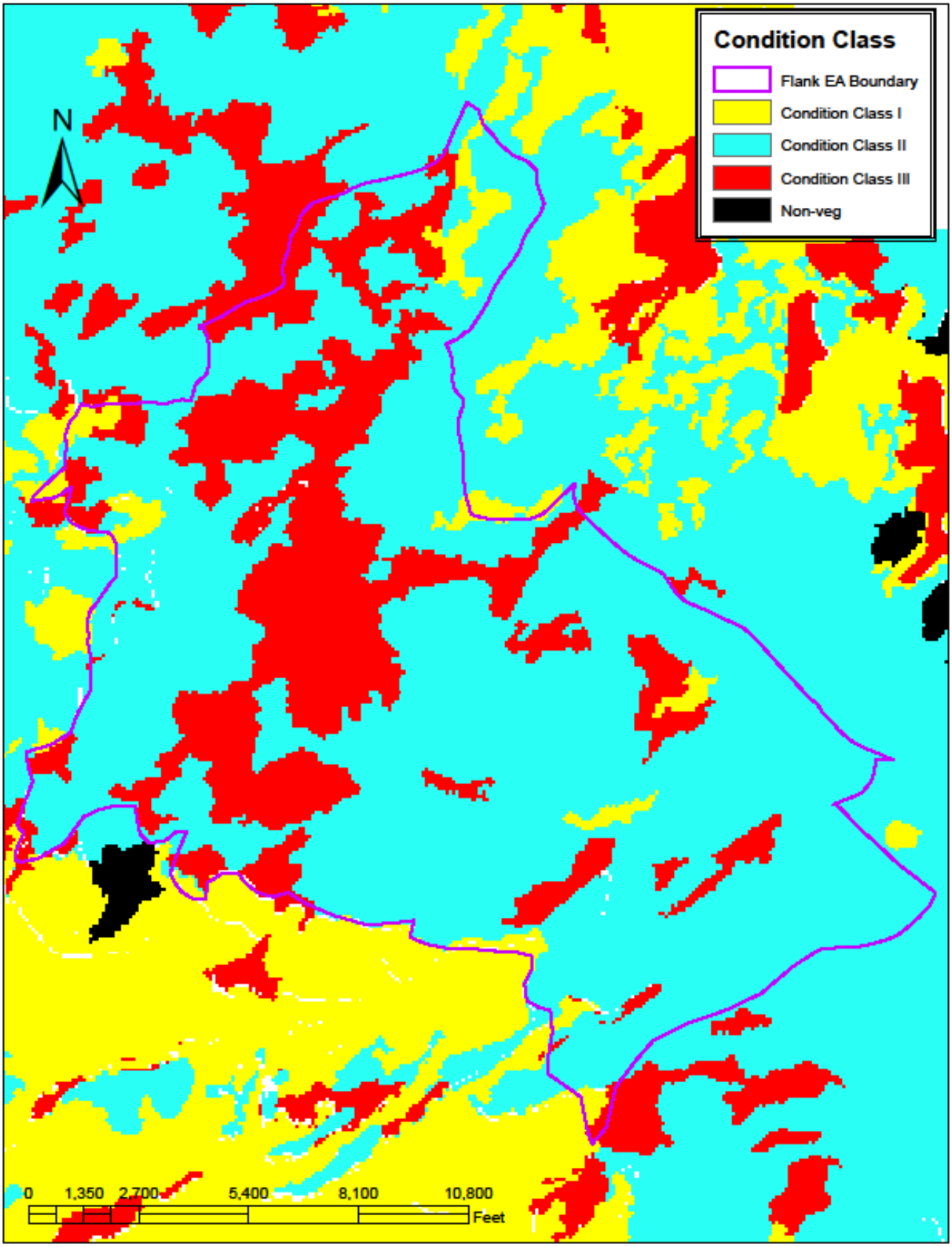

Figure 3.3.2 Condition Classes within the Flank EA

No actions would be implemented under this alternative. Fire suppression activities would continue in the event of a wildfire. Shrubs and grass would continue to grow, increasing the biomass. Lodgepole pine mortality associated with mountain pine activity would continue. Ponderosa pine would die off through natural selection from beetles, disease, fire, and competition. Both of these situations would increase the number of snags and ultimately downed wood across the landscape and project area.

In the short term (10 years or less) there would be little change in the number of acres in each fire regime's condition class. In the long term (10-20 years), there is potential for a larger number of acres to change condition classes. Table 3.3.4 shows acres of each condition class by fire regime.

This is relevant because 95.5% of the area is fire regime I and the condition classes shift much quicker to a further departure from the natural (historical) variability. In comparison, the condition classes within fire regimes III and IV take longer to depart from the natural (historical) variability. The condition class acres, within each fire regime, would depart further from the natural (historical) variability over time, until an event returns acreage to the natural variability.

Table 3.3.4 Condition Class and Fire Regime under current conditions

Fire Regime	Description	Condition Class	Deviation from normal	Alt 1 (acres)
I	1-35 year return, low to mixed severity, 25-75% overstory replacement	1	Low	196
		2	Moderate	4,006
		3	High	1,358
III	35-100 year return, mixed to low severity	1	Low	2
		2	Moderate	6
		3	High	0
IV	35-100 year return, high severity, stand replacement	1	Low	59
		2	Moderate	114
		3	High	67
	Non-forest (meadows, rocks, lava)			16

The number of acres with fire behavior ratings of moderate or low would not change in the short term. Longer term, the number of acres in those 2 levels would decline and move toward a more extreme fire behavior. This would be due to the accumulation of downed woody material resulting from the mortality associated with ongoing bark beetle activity and the subsequent falling of snags, and increase in shrub density, volume, and height.

Fuel loadings would increase, primarily from the accumulation of vegetation (shrub) material. Some down dead woody material would increase due to existing lodgepole pine snags falling over. Ponderosa pine snags falling over would happen in the long term.

Current fire behavior was modeled using BEHAVE to calculate potential fire intensity (flame length) and rate of spread. Conditions for a problem fire (90^{th} percentile weather) were used for the analysis. A problem fire is one which burns under conditions that result in a threat to resource values within or adjacent to the project area. Problem fire conditions are typically at or above what would normally be considered extreme fire conditions.

Table 3.3.5 Fire Behavior Potential by Alternative as a Percentage of the Project Area

Fire Behavior Potential	Flame Length (ft)	Alt 1 (%)	Alt 2 (%)	Alt 3 (%)
Low (Model 8)	<4	6	6	6
Moderate (Models 1, 9)	4	<1	78	78
High/Extreme (Models 2, 6, & 10)	>8	94	16	16
Non-forested	NA	<1	<1	<1

Table 3.3.6 Fire Behavior Potential by Alternative in Acres

Fire Behavior Potential	Flame Length (ft)	Alt 1 (acres)	Alt 2 (acres)	Alt 3 (acres)
Low (Model 8)	<4	343	358	343
Moderate (Models 1, 9)	4	34	4,571	4,547
High/Extreme (Models 2, 6, & 10)	>8	5,431	879	918
Non-forested	NA	16	16	16

Long term, more than 10 years, natural development patterns would result in additional acres transitioning from low to moderate and high and extreme fire behavior potential categories. Most or all of the project area, including adjacent lands, would likely be subject to a large, intense, stand-replacing wildfire event.

The number of acres rated as low for fire behavior potential would not change in the short term (10 years or less). Analysis of current conditions suggests that about 93 percent of the project area would experience flame lengths 4 feet or greater in length (Table 3.3.5, Alt 1). This equates to fire behavior potentials of moderate to extreme. In these areas, control would require the use of heavy equipment (dozers) to construct fireline or, in extreme cases, require the application of aerial retardant. Threats to human safety and life for both the public and firefighters would remain relatively high during wildfire events.

Moderate to extreme fire behavior potential coupled with high fire intensities would limit or preclude the use of ground based equipment to directly attacking a fire. With limited control options, damage or loss of resources would be relatively high. In comparison, the 18 fire (July 23, 2003, 97th percentile weather), the Cave fire (August 19, 2005, 90th percentile weather), and the Woodside Ranch fire (August 1, 2008, 90th percentile weather) burned in similar ponderosa pine stands. These three fires caused greater than 90 percent mortality of all trees within the fire. BEHAVE modeling confirms what occurred within these fire areas (Figure 3.3.4).

Both alternatives create a defensible space along the major travel route (FS Road 18), where the EA is adjacent to the road.

The BEHAVE modeling tool was used, with 90th percentile weather, to look at probability of mortality. The data shown in table 3.3.4 did not show the 97th percentile weather as the results were the same as for a 90th percentile weather day. This was done to compare a possible fire within the Flank EA area to fires that burned in similar stand type and conditions (mentioned above). No trees

greater than twenty-five inches DBH were measured within Flank EA area. The BEHAVE model results were comparable to fires that burned in similar stand type and weather conditions.

The vegetation within, and surrounding, the nearby fires is similar stand type and conditions to that within the Flank project area. The BEHAVE modeling tool was used, with 90th percentile weather, to look at probability of mortality. The results were comparable to the three fires. With these results, a fire burning through the Flank project area should have mortality similar to what occurred during nearby fire events (Figure 3.3.4).

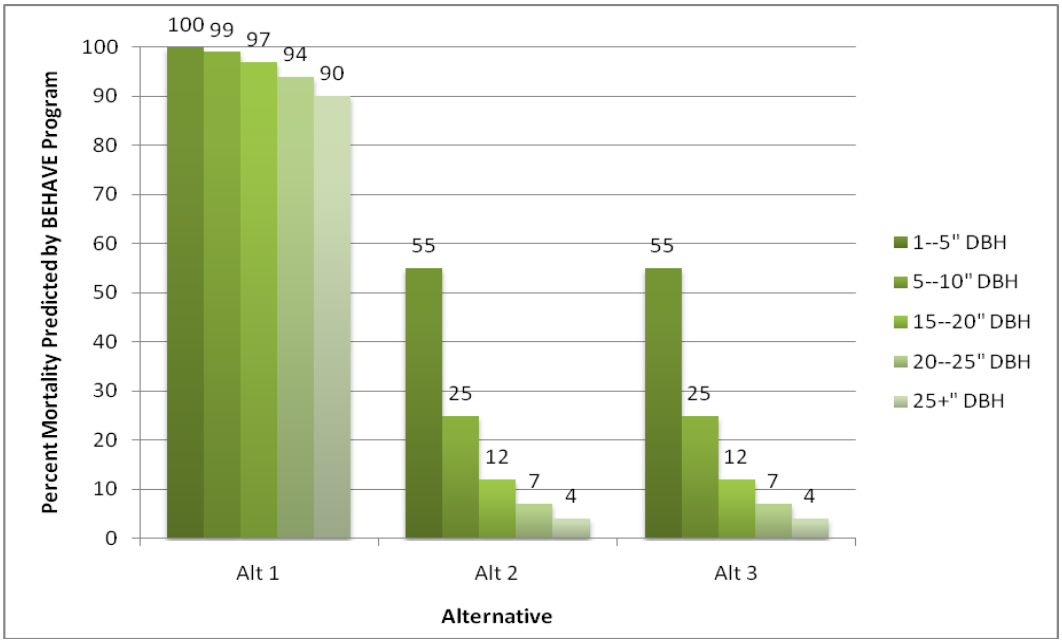

Figure 3.3.4 Probability of Mortality by Alternative Under 90th Percentile Weather Conditions

Air Quality

If a wildfire ignited in the Flank area under the no action alternative, the towns of Bend and Redmond would experience reduced visibility and greatly increased particulate levels that could potentially have negative impact for people with respiratory problems. With east wind conditions, air quality within the Three Sisters Wilderness, a Class I air-shed located west-northwest of the project area, would decline and visitors would likely experience reduced visibility.

3.3.6 Direct and Indirect Effects—Fire and Fuels – Alternatives 2 and 3

Both of these alternatives would be evaluated as the same other than the few units that differ. This variance is due to no fuels treatments around a goshawk nest and possible alternate nesting site (Units 32, 33, 34, 36, 54, & 83).

The effect of these alternatives is to return as much of the area to a desired condition class, as possible. Most of this would be done through landscape scale underburns. Wildfires occurring within fire regimes III (mixed conifer stands) are typically low to mixed severity. Wildfires occurring within fire regime IV (lodgepole pine stands) are typically high severity and/or stand replacing. Stands occurring within this regime are highly susceptible to even low intensity fires with high probability of tree mortality. As condition classes move from 1 to 2 or 3, fire severity and or mortality has the potential to increase.

A diversity of condition classes is good for wildlife as it provides a variety of forage and hiding cover opportunities. For fire behavior diversity of condition classes is easier to manage than an area that is consistently condition class 2 or 3. Because areas of heavy fuel loading are sporadic, intense fire conditions would exist in small pockets where flare-ups and individual torching can be managed. This is opposed to an area that might be all condition class 2 or 3 and be more susceptible to a rolling

crown fire. The percentage of the planning area by fire behavior potential for both alternatives is displayed in table 3.3.5. These numbers are based on the following assumptions:

- After treatment, fuel models 2 and 6 are similar to fuel model 1.
- After treatment, fuel model 10 is similar to fuel model 9. Fuel model 9 has an acceptable fuel loading (between 5-12 tons per acre) as defined by the Forest Plan.

Fuel model 1 fires are flashy, move rapidly, produce less heat, and have less residency time on the ground. Containing these fires still require engines, dozers, and aerial retardant because of their rate of spread. These changes are from the reduction in fuel loading levels associated with the shrub understory. This change is relatively short-lived (10-20 years) due to re-growth and/or reestablishment of understory shrubs.

No areas were found with down woody material in excess of what is defined by the Deschutes National Forest Land Resource Management Plan (5-12 tons per acre).

Fire intensities and fire behavior potential during a wildfire event in these units would be expected to be low to moderate in the short term (10-20 years) after treatment. Fire intensities and behavior would increase as shrubs grow and/or become reestablished. Table 3.3.5 depicts the percentage of the planning area that exists in low, moderate and high potential fire behavior for alternatives 2 & 3 after fuels treatments.

With the combination of pre-commercial thinning and underburning, ladder fuels would be reduced to a minimal level. This reduces the chance of fire getting into the crown and causing torching or independent crown fires.

Following the completion of harvest and slash disposal activities, fuel loadings within these units would returned to a desired or optimal level. The full stand treatment areas would also experience a reduction in crown bulk densities and a reduction in ladder fuels.

Only six specific units were identified for underburning after mowing (Units 20, 50, 56, 75, 76, & 78). Units 20, 50, & 56 are having the combination of treatments done to reduce manzanita. Units 75, 76, & 78 have to be mowed before underburning to protect existing plantations of smaller sized trees.

The rest of the area that is designated to be underburned would have unit size determined when the burn plan is written. Unit size would be evaluated on fuel loading similarity, deer winter range unit size limitations (M7-15), and utilizing roads and trails as boundaries to limit resource damage. Situations may arise where an underburn may not meet the desired effect. Additional entries would be made until the desired effect is reached.

Due to the concentration of fuels on those sites, levels of combustion are more efficient, resulting in much lower levels of particulate production than would be present under wildfire conditions

The chance of mortality from a wild fire would be reduced after treatments are implemented. This would be through a combination of reduction in fuel loading and removal of ladder fuels. Flame lengths on wildfires after treatments would be shorter, the continuity of fuels from the ground to the crown would be disrupted, and the amount of heat produced because of the reduction of fuel quantity and size.

Both alternatives create a defensible space along the major travel route (FS Road 18), where the project is adjacent to the road. The current recommendation for defensible space is to have a treated area 600 feet wide on both sides of roads. Despite the project only being on one side of FS Road 18, the Opine project is adjacent to Flank and on the northeast side of FS Road 18. The fuels treatments within the Opine project would make up the other half of the defined amount for that side of the road.

Air Quality

Conditions that would exist with prescribed burning are used to describe air quality for alternatives 2 and 3. Neither action alternative would result in violation of air quality standards or the Air Quality Act.

All burning activities must comply with National Ambient Air Quality Standards and would be conducted under the rules and regulations of the Oregon Smoke Management Plan administered by the Oregon Department of Forestry. Rules and regulations limit the amount and timing of all burning activities. Such activities would be conducted only when prevailing and predicted wind patterns would not result in measurable impacts to either the Three Sisters Wilderness class I airshed or the Bend Designated Area. The prevailing winds tend to be either a westerly or northwesterly flow, away from these areas. Mechanized harvest areas would only have materials considered un-utilizable left. Most of those materials would be on landings and would be piled. These piles would have the potential of being removed and/or utilized, instead of being burned. Because smoke management regulations would control the timing of burning, impacts to local communities and people with respiratory problems would be expected to much lower than those associated with a wildfire event occurring on those same acres.

3.3.7 Cumulative Effects – Fire and Fuels

This analysis is divided into two sections. The first discusses the cumulative effects on fire and fuels across the two 5th field watersheds the project traverses. The second discusses the cumulative effects on air quality. Current and predicted weather, smoke mixing heights, atmospheric stability, and the proximity of smoke production to Class I airsheds (Three Sisters Wilderness) and designated receptor sites (City of Bend) determine the size of the airshed where impacts would be expected. All activities contributing smoke into the atmosphere, regardless of land ownership or location, are evaluated each day that burning is permitted and prescribed. The combination of all proposed smoke production activities on a given day and under the given weather conditions determines the air or area of impact. Therefore, for this analysis, there is no prescribed or definitive boundary to analyze the effects of the burning. The combination of all activities must fall within the parameters outlined under the Smoke Management Plan administered by the Oregon Department of Forestry for compliance with the Clean Air Act. Past, present and reasonably foreseeable future actions listed in table 3.1 were considered. There would be no cumulative effects as a result of these activities to air quality as all requirements of the Smoke Management Plan would be followed. All activities comply with Forest Plan standards and guidelines.

Fire and Fuels

The Opine and Flank projects overlap for approximately 425 acres. This area is south-west of FS Road 18, for approximately 1,400 feet, and between FS Roads 1825 and FS Road 1800-510. Within the Opine EA, a swath approximately 125 feet wide is to be mowed on the southwest side of FS Road 18. The suggested treatment within the Flank project area is to underburn this area. There aren't any cumulative effects found when analyzed with the other disciplines.
The portion of the Flank EA, which lands within the deer winter range (MA7), would be limited to a maximum of 2.5% (2,952 acres) of underburning within the North Paulina Herd Unit over the entire winter range in one calendar year. This area is incorporated within two other active EAs (Fuzzy & Opine).

All other fuels treatments were greater than 15 years old and weren't considered since any fuels treatments within these areas aren't effective any more.

Air Quality

There are no measurable cumulative effects on air quality associated with this project. The amount of smoke and particulate matter permitted under the Clean Air Act as administered by the State of Oregon is limited. This limit rations the levels of burning based on current and projected weather conditions. Depending on the amount of burning planned during a normal burning season, it may require that more days or more than one burning season would be required to complete all planned ignitions. Requiring additional burn days also increases the number of days that people would potentially be subject to smoke. That increase in potential exposure could increase the risk that smoke would adversely impact individuals with respiratory problems

. However, emission levels would not exceed air quality standards so both the number of individuals affected and the level of impact would be expected to be relatively low.

3.4 Wildlife

3.4.1 Introduction

It is Forest Service policy to avoid all adverse impacts on threatened and endangered species and their habitats except when it is possible to compensate adverse effects totally through alternatives identified in a biological opinion rendered by the Fish and Wildlife Service. Measures are to be identified and prescribed to prevent adverse modification or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (Forest Service Manual, FSM 2670.31). No impacts may be allowed on sensitive species that would result in loss of population viability or create significant trends toward Federal listing. The purpose of the wildlife section of this report is to identify the desired condition for wildlife, to evaluate the effects of the proposed alternatives and wildlife species, and to determine consistency with federal law, the Forest Plan, and other regulatory direction for wildlife management on National Forest (NF) lands. This section of the Flank Environmental Assessment addresses the following wildlife species and habitat categories:

- Federally Threatened, Endangered, and Candidate Species
- Regional Forester's Sensitive Species
- Management Indicator Species
- Birds of Conservation Concern
- Landbird Focal Species
- USFWS Species of Concern
- Snags and Coarse Woody Material
- Special and Unique Habitats
- LOS Habitat and Connectivity

3.4.2 Regulatory Framework

The following documents provide guidance and direction for wildlife:

- Forest Service Manual FSM2600
- Deschutes National Forest Land and Resource Management Plan (LRMP) and Standards and Guidelines describe management objectives for Management Indicator Species (MIS) as amended by the Eastside Screens
- USFWS Birds of Conservation Concern describes management objectives for Birds of Conservation Concern (BCC) and the Bird Conservation Region "Great Basin BCR-9" which applies to the Flank area
- Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington and the Conservation Strategy for Landbirds of the Columbia Basin in Eastern Oregon and Washington provide direction for managing Landbird Focal Species
- USFWS Federally Listed, Proposed, Candidate and Species of Concern of Deschutes County provides guidance for Species of Concern (SOC)
- 2004 USFWS US Shorebird Conservation Plan
- NatureServe Database for Oregon determines Oregon Sensitive Species http:www.NatureServe.org/explorer
- Migratory Bird Treaty Act and Executive Order (131186)
- Endangered Species Act of 1973
- Regional Foresters Sensitive Species List for Region 6 (2008)
- Deschutes National Forest Wildlife Tree and Log Implementation Strategy, 1994 Decayed Wood Management Advisor; Mellen-McLean et al. 2009
- Programmatic BA 9-2012

3.4.3 Threatened and Endangered Species List

Table 3.4.1 Threatened and Endangered Wildlife Species Considered

Species	Status	Habitat	Presence
Northern Spotted Owl *(Strix occidentalis caurina)*	Federal Threatened, MIS, S3	Old-growth mixed conifer forests	No habitat occurs within or adjacent to the proposed project area.
Oregon Spotted Frog *(Rana pretiosa)*	Federal Candidate, Regional Forester Sensitive, S2	Stream, marsh	No habitat occurs within or adjacent to the proposed project area.
Pacific Fisher *(Martes pennanti)*	Federal Candidate, Regional Forester Sensitive, S2	Mixed conifer habitat, complex forest structure.	No habitat occurs within or adjacent to the proposed project area.

*Federally listed species come from the Region 6 Threatened, Endangered, and Sensitive species list for the Deschutes National Forest (January 2008). Oregon Sensitive Species determined from the NatureServe database for Oregon (2009): S1 = critically imperiled, S2 = imperiled, S3 = vulnerable.

As there is no habitat for Northern Spotted Owl, Oregon Spotted Frog, or Pacific Fisher in the project area there would be "No Effect" as a result of project activities to any of these species at the forest level.

3.4.4 Regional Forester's Sensitive Species

Regional forester's sensitive species with habitat in the project area include greater sage-grouse, white headed woodpecker, Lewis' woodpecker, Johnson's hairstreak, and the Townsend's big eared bat. This project would not contribute to an overall downward trend in species viability at the forest level for any of the region six sensitive species mentioned here.

Table 3.4.2 Regional Forester's Sensitive Species Considered

Species	Status	Habitat	Presence
Birds			
Northern bald eagle *(Haliaeetus leucocephalus)*	Regional Forester Sensitive, MIS, S4B, S4N	Lakeside or riverside with large trees	No habitat occurs within or adjacent to the proposed project area.
American peregrine falcon *(Falco peregrinus anatum)*	Regional Forester Sensitive, BCC, S2B	Riparian, cliffs	No habitat occurs within or adjacent to the proposed project area.
Greater (Western) sage grouse *(Centrocercus urophasianus phaios)*	**Regional Forester Sensitive, BCC, S3**	**Sagebrush flats and ecotones between sagebrush flats and open forest**	**Habitat occurs within or adjacent to the proposed project area.**
Lewis' woodpecker *(Melanerpes lewis)*	**Regional Forester Sensitive, MIS, BCC, Landbird focal species, SOC, S2S3B**	**Open ponderosa pine forests, large diameter dead or dying trees, burned forests**	**Habitat occurs within or adjacent to the proposed project area.**

White-headed woodpecker *(Picoides albolarvatus)*	**Regional Forester Sensitive, MIS, BCC, Landbird focal species, SOC, S2S3B**	**Mature ponderosa pine forest; weak excavator**	**Habitat occurs within or adjacent to the proposed project area.**
Harlequin duck *(Histrionicus histrionicus)*	Regional Forester Sensitive, MIS, S2B, S3N	Rapid streams, large trees	No habitat occurs within or adjacent to the proposed project area.
Bufflehead *(Bucephala albeola)*	Regional Forester Sensitive, MIS, S2B, S5N	Lakes, snags	No habitat occurs within or adjacent to the proposed project area.
Horned grebe *(Podiceps auritus)*	Regional Forester Sensitive, MIS, S2B, S5N	Lakes, emergent vegetation	No habitat occurs within or adjacent to the proposed project area.
Red-necked grebe *(Podiceps grisegena)*	Regional Forester Sensitive, MIS, S1B, S4N	Lakes	No habitat occurs within or adjacent to the proposed project area.
Yellow rail *(Coturnicops noveboracensis)*	Regional Forester Sensitive, BCC, S1B	Marshes	No habitat occurs within or adjacent to the proposed project area.
Tricolored blackbird *(Agelaius tricolor)*	Regional Forester Sensitive, BCC, S2B	Lakeside, bullrush	No habitat occurs within or adjacent to the proposed project area.
Northern waterthrush *(Seiurus noveboracensis)*	Regional Forester Sensitive, S2B	Dense riparian wouldows	No habitat occurs within or adjacent to the proposed project area.
Mammals			
California wolverine *(Gulo gulo luteus)*	Regional Forester Sensitive, SOC, S1(?)	Mixed conifer habitat, high elevation	No habitat occurs within or adjacent to the proposed project area.
Pygmy rabbit *(Brachylagus idahoensis)*	Regional Forester Sensitive, SOC, S2(?)	Sagebrush flats	No habitat occurs within or adjacent to the proposed project area.
Townsend's big-eared bat *(Corynorhinus townsendii)*	**Regional Forester Sensitive, SOC, MIS, S2**	**Caves and old dwellings**	**Habitat occurs within or adjacent to the proposed project area.**
Invertebrates			
Crater Lake tightcoil *(Pristiloma arcticum crateris)*	Regional Forester Sensitive, S1	Wet vegetation zone	No habitat occurs within or adjacent to the proposed project area.
Silver-bordered fritillary *(Boloria selene)*	Regional Forester Sensitive, S2	Wet meadows, bogs, and marshes	No habitat occurs within or adjacent to the proposed project area.
Pristine springsnail *(Pristinicola hemphilli)*	Regional Forester Sensitive, S2	Small springs and seeps	No habitat occurs within or adjacent to the proposed project area.
Johnson's hairstreak *(Callophrys johnsoni)*	**Regional Forester Sensitive, S2(?)**	**Coniferous forests, especially old-growth**	**Habitat occurs within or adjacent to the proposed project area.**

*Regional Forester Sensitive Species come from the Region 6 Threatened, Endangered, and Sensitive species list for the Deschutes National Forest (January 2008); Oregon Sensitive Species determined from the NatureServe database for Oregon: S1 = critically imperiled, S2 = imperiled; S3 = vulnerable, S4 = apparently secure, S5 = secure, N = nonbreeding, B = breeding.

Direct and indirect effects on Regional Forester Sensitive Species are discussed below, except the two woodpeckers, white-headed and Lewis', are discussed under the woodpecker section, and Townsend's big-eared bats are discussed in the bat section.

Greater Sage-Grouse

Existing Condition

This grouse is a sagebrush obligate (i.e. requires sagebrush) found on sagebrush-dominated areas east of the Cascades (Aldrich 1963). They rely on sagebrush for food and cover throughout the year

(Jenny K Barnett *in* Marshall et al. 2006). During the spring and summer months they may use the fringes of open forest habitat types with good herbaceous understories. There are some small inclusions of sagebrush openings within the project area, but all are within a heavily forested matrix. To the north of the project area, Evans West fire burned in 1996 and now has a number of areas dominated by sagebrush, and to the east of the project area, there are xeric shrublands and ponderosa pine-sagebrush types which provide potential habitat, so while there is no habitat within the project boundaries, habitat is available adjacent to the project boundaries. Sage grouse using this adjacent habitat could, therefore, be affected by project implementation.

Direct, and Indirect Effects – Greater Sage Grouse –Alternative 1

With the no action alternative, there would be no indirect, direct or cumulative adverse effects or impacts to greater sage grouse.

Direct, and Indirect Effects – Greater Sage Grouse –Alternatives 2 & 3

There are no known indirect, direct, or cumulative negative effects or impacts on this species by the action alternatives of this project. This determination is based upon: 1) habitat is adjacent to the project area rather than within it; and 2) no planned treatments would substantially eliminate or degrade sagebrush cover. Based on these effects the project would not contribute to an overall downward trend in species viability for greater sage grouse at the forest level.

Johnson's Hairstreak

Existing Condition – Johnson's Hairstreak

This butterfly species can be found in coniferous forests, especially old-growth, that contain mistletoes of the genus *Arceuthobium,* which grow on conifers (Larsen et al. 1995). The eggs from the butterfly are laid on the mistletoe, the caterpillars feed on exclusively of the aerial shoots of dwarf mistletoes (LaBonte et al. 2001), and the chrysalids hibernate in the mistletoe mass (Black and Lauvray 2005). This is considered the only old-growth obligate butterfly (Pyle 2002), however, Larsen et al. (1995) suggests that younger forests may also have the potential to support populations of this butterfly. Although primarily associated with old-growth forests with red firs, western hemlocks, or gray pines, its caterpillars feed on *Arceuthobium* species, and species of this genus occur in ponderosa pines, suggesting possible habitat within the project area. Adult butterflies nectar on a variety of species including those with the genera *Arctostaphylos* and *Ceanothus,* both of which occur within the project area (Shields 1965) as well. Opler et al. 2009 lists the management of this species requiring the maintenance of old-growth forests. Although this species has primarily been associated with mistletoes growing in old-growth hemlock and Douglas-fir, these caterpillars may also utilize the mistletoes infecting lodgepole and ponderosa pines within the project area. There is a lack of information on this species, but it is possible that most of the project area is potential habitat.

Direct and Indirect Effects – Johnson's Hairstreak –Alternative 1

With the no action alternative, there would be no immediate impacts to Johnson's hairstreaks or their habitats. In the long-term, tree growth would remain slow, and mature stand structure would be slower to develop, however, these dense conditions have results in trees that are highly susceptible to dwarf mistletoe. The no action alternative could result in increasing dwarf mistletoe, benefitting Johnson's hairstreak caterpillars. A stand-replacement fire, however, would remove vulnerable trees, and the seedlings and saplings which could eventually be hosts, resulting in long-term negative impacts on this species.

Direct and Indirect Effects – Johnson's Hairstreak –Alternative 2

In this alternative, treatments were designed to remove many of the trees with dwarf mistletoe, and to develop healthier stands that would be resistant to dwarf mistletoe in the future. Since these treatments are specifically targeted at the trees which host the primary food of these caterpillars, treatments would have at least a short-term negative impact on individuals and local populations. To provide refugia within the proposed treatment area, 10% of each stand would remain untreated, providing for a variety of wildlife species including the Johnson's hairstreak. Additionally, there is a high occurrence of dwarf mistletoe across the forest, and treatments would not eliminate it, even within the project area. The treatments would also result in stands developing a mature structure more rapidly, and in having greater resiliency to stand-replacement fires which would completely remove habitat in areas that burned. As a result, long-term effects would likely be positive.

Direct and Indirect Effects – Johnson's Hairstreak –Alternative 3

The effects of alternative 3 would be similar to those for alternative 2. Under alternative 3, 73 fewer acres would be treated and 198 fewer acres would be underburned as compared to alternative 2. Slightly less area would be treated, and several stands would be left at higher densities. More current habitat would be retained under alternative 3 than alternative 2, more areas would remain at higher levels of vulnerability to dwarf mistletoe, but mature forest structure would be slower to develop in those stands.

Cumulative Effects – Johnson's Hairstreak

Cumulative effects were analyzed for Forest Service land at the 6th field subwatershed level which includes Horse Ridge, Hunter and Teepee Draw subwatersheds for a total of 71,718 (51,930) acres. This is a commonly used scale because it reflects larger scale landscape issues as they impact wildlife, while remaining small enough to evaluate the impact on individual populations of snag dependent species. Proposed, current, past, and foreseeable actions include continued fuels treatments, timber stand improvement, firewood collection, and salvage logging (see Table 3.1). The cumulative effects of these projects are a decrease across the watershed of mistletoe but an increase in mature and old-growth conditions. Therefore, the short-term cumulative effects would be negative; however, the long-term cumulative effects should be positive. The project would not contribute to an overall downward trend in species viability for Johnson's Hairstreak at the forest level.

3.4.5 Management Indicator Species, Focal Bird Species, Birds of Conservation Concern, and High Priority Shorebirds.

Table 3.4.3 Management Indicator Species, Focal Bird Species, Species of Concern, and High Priority Shorebirds Considered

Species	Status	Habitat	Presence
Birds			
Golden eagle *(Aquila chrysaetos)*	MIS, BCC, S4	Large open areas with cliffs and rock outcroppings	No habitat occurs within or adjacent to the proposed project area.
Osprey *(Pandion haliaetus)*	MIS, S4	Large snags associated with fish bearing water bodies	No habitat occurs within or adjacent to the proposed project area.
Great gray owl *(Strix nebulosa)*	MIS, S3	Mature and old-growth forests associated with openings and	No habitat occurs within or adjacent to the proposed project area.

		meadows	
Flammulated owl *(Otus flammeolus)*	BCC, Landbird focal species, S3B	Interspersed grassy openings and dense thickets in mixed conifer forests and old-growth ponderosa pine forests	Habitat occurs within or adjacent to the proposed project area.
Burrowing owl *(Athene cunicularia)*	BCC, SOC, S3B	Open grassland or agricultural land	No habitat occurs within or adjacent to the proposed project area.
Northern goshawk *(Accipiter gentilis)*	MIS, SOC, S3	Mature and old-growth forests, especially high canopy closure and large trees	Habitat occurs within or adjacent to the proposed project area.
Cooper's hawk *(Accipiter cooperii)*	MIS, S4	Similar to goshawk, can also use mature forests with high canopy cover/tree density	Habitat occurs within or adjacent to the proposed project area.
Sharp-shinned hawk *(Accipiter striatus)*	MIS, S4	Similar to goshawk in addition to young, dense, even-aged stands	Habitat occurs within or adjacent to the proposed project area.
Red-tailed hawk *(Buteo jamaicensis)*	MIS, S5	Large snags, open country interspersed with forests	Habitat occurs within or adjacent to the proposed project area.
Ferruginous hawk *(Buteo regalis)*	BCC, SOC, Landbird focal species, S3B	Open sagebrush flats	No habitat occurs within or adjacent to the proposed project area.
Swainson's hawk *(Buteo swainsoni)*	BCC, S3B	Open country	No habitat occurs within or adjacent to the proposed project area.
Prairie falcon *(Falco mexicanus)*	BCC, Landbird focal species, S4	Rimrock and open country	No habitat occurs within or adjacent to the proposed project area.
Pileated woodpecker *(Dryocopus pileatus)*	MIS, S4	Mature to old-growth mixed conifer forests	No habitat occurs within or adjacent to the proposed project area.
Three-toed woodpecker *(Picoides dorsalis, Picoides tridactylus dorsalis)*	MIS, S3	High elevation and lodgepole pine forests	Habitat occurs within or adjacent to the proposed project area.
Wouldiamson's sapsucker *(Sphyrapicus thyroideus)*	MIS, BCC, Landbird focal species, S4B, S3N	Mature or old-growth conifer forests with open canopy cover; weak excavator	Habitat occurs within or adjacent to the proposed project area.

Red-naped sapsucker *(Sphyrapicus nuchalis)*	MIS, Landbird focal species, S4	Riparian hardwood forests	No habitat occurs within or adjacent to the proposed project area.
Northern flicker *(Colaptes auratus)*	MIS, S5	Variety of forest types but more associated with forest edges	Habitat occurs within or adjacent to the proposed project area.
Hairy woodpecker *(Picoides villosus)*	MIS, S4	Mixed conifer and ponderosa pine forests	Habitat occurs within or adjacent to the proposed project area.
Black-backed woodpecker *(Picoides arcticus)*	MIS, Landbird focal species, S3	Lodgepole pine forests, burned forests	Habitat occurs within or adjacent to the proposed project area.
Clark's nutcracker *(Nucifraga Columbiana)*	Landbird, S4	Mature/old-growth whitebark pine	No focal habitat occurs within or adjacent to the proposed project area.
Sage thrasher *(Oreoscoptes montanus)*	Landbird, BCC, S4	Large, contiguous sagebrush shrublands and shrub-steppe	No habitat occurs within or adjacent to the proposed project area.
Bobolink *(Dolichonyx oryzivorus)*	Landbird, S2B	Meadows and grasslands	No habitat occurs within or adjacent to the proposed project area.
Loggerhead shrike *(Lanius ludovicianus)*	BCC, S3B, S2N	Open habitat with scattered trees and shrubs	Habitat occurs within or adjacent to the proposed project area.
Yellow-breasted chat *(Icteria virens)*	Landbird, SOC, S4B	Riparian thickets	No habitat occurs within or adjacent to the proposed project area.
Yellow warbler *(Dendroica petechia)*	Landbird, S4	Riparian areas, deciduous and mixed woodlands, and coniferous forests	No habitat occurs within or adjacent to the proposed project area.
Nashville warbler *(Vermivora ruficapilla)*	Landbird, S4?	Mixed conifer/hardwood forests, scattered trees with brush, clearcuts	No habitat occurs within or adjacent to the proposed project area.
Virginia's warbler *(Vermivora virginiae)*	BCC	Mountain mahogany	No habitat occurs within or adjacent to the proposed project area.
Black-throated sparrow *(Spizella bilineata)*	Landbird, S3B	Boulder-strewn slopes of arid deserts	No habitat occurs within or adjacent to the proposed project area.
Lark sparrow *(Chondestes grammacus)*	Landbird, S4?	Shrub-steppe, grasslands, fields, and juniper woodlands	Habitat occurs within or adjacent to the proposed project area.
Grasshopper sparrow	Landbird, S2B	Grasslands and grainfields	No habitat occurs within or adjacent to the proposed

(Ammodramus savannarum)			project area.
Brewer's sparrow (Spizella breweri)	BCC, S4B	Sagebrush habitats	Habitat occurs within or adjacent to the proposed project area.
Chipping sparrow *(Spizella passerina)*	Landbird focal species, S4	Open understory ponderosa pine forests with regeneration	Habitat occurs within or adjacent to the proposed project area.
Sage sparrow *(Amphispiza belli)*	BCC, S4B	Large, contiguous sagebrush habitats	No habitat occurs within or adjacent to the proposed project area.
Black-chinned sparrow (*Spizella atrogularis)*	BCC	Ceanothus- and oak-covered hillsides	No habitat occurs within or adjacent to the proposed project area.
Bullock's oriole *(Icterus bullockii)*	Landbirds, S4	Riparian areas, farmlands, orchards, and irrigated woodlands	No habitat occurs within or adjacent to the proposed project area.
Brown creeper *(Certhia americana)*	Landbird focal species, S4	Large trees in mixed conifer	No focal habitat occurs within or adjacent to the proposed project area.
Hermit thrush *(Catharus guttatus)*	Landbird, S4	Multi-layered/dense canopy in mixed conifer forests	No habitat occurs within or adjacent to the proposed project area.
Lazuli bunting *(Passerina amoena)*	Landbird, S4	Montane brushfields, regenerating clearcuts, forest openings	Habitat occurs within or adjacent to the proposed project area.
Gray flycatcher *(Empidonax wrightii)*	Landbird, S4	Arid pine and juniper woodlands and sagebrush shrublands	Habitat occurs within or adjacent to the proposed project area.
Wouldow flycatcher (Empidonax trailii)	Landbird, BCC, SOC, S4	Riparian areas	No habitat occurs within or adjacent to the proposed project area.
Olive-sided flycatcher *(Contopus cooperi)*	Landbird focal species, S3B	Edges and openings created by wildfire in mixed conifer and ponderosa pine forests	Habitat occurs within or adjacent to the proposed project area.
Ash-throated flycatcher *(Myiarchus cinerascens)*	Landbird, S4?	Oak and juniper woodlands	No habitat occurs within or adjacent to the proposed project area.
Pygmy nuthatch *(Sitta pygmaea)*	Landbird focal species, S4	Mature ponderosa pine forests and snags	Habitat occurs within or adjacent to the proposed project area.
Gray vireo *(Vireo vicinior)*	Landbird	Rocky, dry hillsides with scattered trees	No habitat occurs within or adjacent to the proposed project area.

Pinyon jay *(Gymnorhinus cyanocephalus)*	BCC, S3S4	Pinyon pine and juniper, ponderosa woodlands, ponderosa pine edges	Habitat occurs within or adjacent to the proposed project area.
Green-tailed towhee *(Pipilo chlorurus)*	BCC, S4B	Shrub stands, grasslands, forest openings	Habitat occurs within or adjacent to the proposed project area.
Black rosy finch *(Leucosticte atrata)*	BCC, S2B	Alpine areas	No habitat occurs within or adjacent to the proposed project area.
McCown's longspur *(Calcarius mccownii)*	BCC	Dry, sparse prairies	No habitat occurs within or adjacent to the proposed project area.
Blue grouse *(Dendragapus obscurus sierrae)*	Landbird, S4	Subalpine fir	No focal habitat within or adjacent to the proposed project area.
Sharp-tailed grouse *(Tympanuchus phasianellus)*	Landbird, SX	Grasslands and sagebrush steppe	No habitat occurs within or adjacent to the proposed project area.
Mountain quail *(Oreortyx pictus*	SOC, S4	Brushy mountainsides, coniferous forest, forest and meadow edges, sagebrush, pinyon and juniper	Habitat occurs within or adjacent to the proposed project area.
Yellow-billed cuckoo *(Coccyzus americanus)*	BCC, Focal landbird, SHB	Riparian hardwood forests	No habitat occurs within or adjacent to the proposed project area.
Calliope hummingbird *(Stellula calliope)*	BCC	Mountain meadows, open forests, forest edges, and riparian areas	No habitat occurs within or adjacent to the proposed project area.
Black swift *(Cypseloides niger)*	BCC, S2B	Damp coastal cliffs	No habitat occurs within or adjacent to the proposed project area.
Sandhill crane *(Grus canadensis)*	Landbird, S3	Montane meadows	No habitat occurs within or adjacent to the proposed project area.
Great blue heron *(Ardea herodias)*	MIS, S4	Riparian edge habitats including lakes, streams, marshes, and estuaries	No habitat occurs within or adjacent to the proposed project area.
Snowy plover *(Charadrius alexandrinus)*	BCC, Shorebird, S2	Sandy beaches	No habitat occurs within or adjacent to the proposed project area.
American golden plover *(Pluvialis*	BCC, Shorebird, SNA	Upland tundra, rare in OR in dry	No habitat occurs within or adjacent to the proposed

dominica)		mudflats, fields, and pastures	project area.
Long-billed curlew *(Numenius americanus)*	BCC, Shorebird, S3B	Dry grasslands	No habitat occurs within or adjacent to the proposed project area.
Marbled godwit *(Limosa fedoa)*	BCC, Shorebird, SNA	Expansive mudflats and sandflats on beaches	No habitat occurs within or adjacent to the proposed project area.
Sanderling *(Calidris alba)*	BCC, Shorebird, SNA	Sandy beaches with wave action	No habitat occurs within or adjacent to the proposed project area.
Whimbrel *(Numenius phaeopus)*	BCC, Shorebird, SNA	Grassy marshes and tidal flats	No habitat occurs within or adjacent to the proposed project area.
American avocet *(Recurvirostra Americana)*	BCC, S4	Shallow water	No habitat occurs within or adjacent to the proposed project area.
Solitary sandpiper *(Tringa solitaria)*	BCC, Shorebird	Small, fresh water mudflats	No habitat occurs within or adjacent to the proposed project area.
Upland sandpiper (*Bartramia longicauda)*	Shorebird, S1B	Grassy fields (4-8" tall) with open patches	No habitat occurs within or adjacent to the proposed project area.
Western sandpiper *(Calidris mauri)*	Shorebird, SNA	Mudflats and shallow muddy ponds along coast	No habitat occurs within or adjacent to the proposed project area.
Short-billed dowitcher *(Limnodromus griseus)*	Shorebird, SNA	Mudflats and shallow muddy ponds along coast	No habitat occurs within or adjacent to the proposed project area.
Wilson's phalarope *(Phalaropus tricolor)*	BCC, Shorebird, S4	Shallow ponds within grassy marshes	No habitat occurs within or adjacent to the proposed project area.
Eared grebe (*Podiceps nigricollis)*	MIS, S4	Open water with emergent vegetation	No habitat occurs within or adjacent to the proposed project area.
Black tern *(Chlidonias niger*	SOC, S3B	Freshwater habitats	No habitat occurs within or adjacent to the proposed project area.
Mule deer *(Odocoileus hemionus)*	MIS, S5	Mixed habitats	Habitat occurs within the proposed project area.
Elk *(Cervus elephas)*	MIS, S5	Mixed habitats	Habitat occurs within the proposed project area.
American marten *(Martes americana)*	MIS, S3S4	Mixed conifer or high-elevation late-successional forests with abundant down woody material	No habitat occurs within or adjacent to the proposed project area.
Silver-haired bat *(Lasionycteris*	SOC, S3S4	Forested areas adjacent to lakes,	No habitat occurs within or adjacent to the proposed

noctivagans)		ponds, and streams	project area.
Small-footed myotis bat *(Myotis ciliolabrum)*	SOC, S3S4	Cliffs and rock canyons in arid grassland and desert scrub, ponderosa pine and mixed conifer forest	Habitat occurs within or adjacent to the proposed project area.
Long-eared myotis bat *(Myotis evotis)*	SOC, S4	Forested habitats and forested edges, including areas in ponderosa pine	Habitat occurs within or adjacent to the proposed project area.
Long-legged myotis bat *(Myotis volans)*	SOC, S3	Forested habitat, most notably old growth stands, including ponderosa pine	Habitat occurs within or adjacent to the proposed project area.
Yuma myotis bat (Myotis yumanensis)	SOC, S3	Various upland and lowland habitats near open water	No habitat occurs within or adjacent to the proposed project area.
Preble's shrew *(Sorex preblei)*	SOC, S3?	Various, including openings in montane coniferous forests dominated by sagebrush	Habitat occurs within or adjacent to the proposed project area.
Coastal tailed frog (Ascaphus truei)	SOC, S3	Mountain streams	No habitat occurs within or adjacent to the proposed project area.
Oregon slender salamander *(Batrachoseps wrighti)*	SOC, S2S3	Moist Douglas-fir and mixed maple, hemlock, and red-cedar woodlands	No habitat occurs within or adjacent to the proposed project area.
Cascades frog *(Rana cascadae)*	SOC, S3	Wet mountain meadows, sphagnum bogs, ponds, lakes, and streams	No habitat occurs within or adjacent to the proposed project area.
Northern sagebrush lizard *(Sceloporus graciosus graciosus)*	SOC, S5	Sagebrush and pine woodlands	Habitat occurs within or adjacent to the proposed project area.
California floater mussel *(Anodonta californiensis)*	SOC, S2	Lakes and lake-like stream environments	No habitat occurs within or adjacent to the proposed project area.
Snags and Downed Wood associated species and habitat	MIS	Snags and down woody material	Habitat occurs within the proposed project area.
Late/Old Structural	MIS	Late/Old Structural	No habitat occurs within or adjacent to the proposed

			project area.
Unique/Special Features	MIS	Unique/Special Features	Habitat occurs within the proposed project area.

* Management Indicator Species (MIS) come from the Deschutes National Forest Land and Resource Plan (LRMP) [1990]; Birds of Conservation Concern (BCC) come from the USFWS Birds of Conservation Concern—BCR 9 (Great Basin) [2008]; Landbird Focal Species come from the Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington (Altman 2000) and from the Conservation Strategy for Landbirds of the Columbia Basin in Eastern Oregon and Washington (Altman and Holmes 2000); Species of Concern come from USFWS Federally listed, proposed, candidate species and species of concern of Deschutes County, and Shorebirds come from the 2004 USFWS US Shorebird Conservation Plan. Oregon Sensitive Species determined from the NatureServe database for Oregon: S1 = critically imperiled, S2 = imperiled; S3 = vulnerable, S4 = apparently secure, S5 = secure, N = nonbreeding, B = breeding, SNA = status not applicable, SHB = possibly extirpated.

3.4.2 Snags, Coarse Woody Material, and Green Tree Replacements

Introduction –Snags Coarse Woody Material, and Green Tree Replacements

Numerous species of animals use snags and coarse woody material (CWM) for foraging, nesting, denning, roosting and resting. A snag is defined as a dead tree that is over 10 inches in diameter at breast height (dbh) and taller than 6 feet (USDA FS 1996, REO2010). Coarse woody material is considered to be dead and downed material that is greater than 10 inches in diameter at the small end. However, use varies by species, with many species selecting for larger snags and/or logs, or using taller snags for nesting.

The most notable species that use snags and CWM are the primary cavity nesters (e.g. woodpeckers and nuthatches) that excavate nest cavities in decayed wood in standing trees. Vacated cavities may subsequently used by many other birds and small mammals (i.e. secondary cavity users). Wildlife species known or suspected to occur in the Flank planning area that utilize these habitats include the flammulated owl, northern pygmy owl, white-headed woodpecker, black-backed woodpecker, Wouldiamson's sapsucker, pygmy nuthatch, brown creeper, mountain bluebird, American marten, and long-legged myotis. These species were selected because of the availability of recent species data synthesis in the DecAID (Mellen et al. 2009) tool; it is not a comprehensive list.

Analysis Methods–Snags Coarse Woody Material, and Green Tree Replacements

Snag and CWM habitat conditions were analyzed and compared using current direction and newer research, including DecAID. DecAID Advisor is a planning tool intended to help specialists manage snag and log levels for their individual management areas and the associated wildlife species. This tool uses the best available science and most recent research for species that are dependent on snags and coarse woody material. Snag densities are given in the form of wildlife species tolerance levels at the 30%, 50%, and 80% levels. If an 80% tolerance level is 4 snags per acres, this means that 80% of the nests were located in areas with 4 or fewer snags per acre, and only 20% had more than 4 snags per acre. Existing snag and log densities and sizes were collected following Bates et al. 2008a and Bates et al. 2008b and supplemented by GIS layers which including 2004-2009 insect and disease aerial survey data from USDA Forest Service Forest Health Protection and gradient nearest neighbor data from Landscape Ecology, Modeling, Mapping & Analysis funded by the Joint Fire Science Program. According to Forest Service GIS layers, 97% of the proposed project area is classified as Ponderosa Pine Dry, and 3% is classified as Lodgepole Pine Dry, although most of the area currently classified as Lodgepole Pine Dry includes large diameter ponderosa pine stumps and a substantial proportion of ponderosa pine.

Stand exam data from 14 of the stands within the project area were available and used in running Forest Vegetation Simulator (FVS) to examine the long-term results of treatments on snag densities based on each snag size class.

Existing Condition – Snags

The Flank planning area would tend to support wildlife at the lower tolerance levels (30%-50%). The habitat types found within this area are within a high frequency fire regime. Topography is generally flat to moderate slopes. The eastern portion of the project area is near the transition from forest to

woodland to sagebrush shrub-steppe. This suggests that the relative potential levels of dead wood would be low to moderate. The more moderate levels of dead wood are found in the higher elevations on the western portion of the planning area.

Table 3.4.4 is a summary of the current snag levels (determined from 2009 snag surveys) followed by a summary of the wildlife data from DecAID. Current snag densities were calculated from snag surveys within the proposed project area and associated subwatersheds. Additional data from stand exams of select stands, aerial survey data, and GNN data provide similar results. Selected species are MIS species that may be found in the planning area and displayed by habitat type, from the DecAID advisor.

Table 3.4.4 Snag Densities for Wildlife Species at 30, 50 and 80% Tolerance Level for Snags Based on Wildlife Data in DecAID[2]

	30% Tolerance level (#snags/acre)		50% Tolerance level (#snags/acre)		80% Tolerance level (#snags/acre)	
	≥10"dbh	≥20"dbh	≥10"dbh	≥20"dbh	≥10"dbh	≥20"dbh
Ponderosa pine (97% of project area)						
Existing snag levels	0.7	0.4				
Black-backed woodpecker (BBWO)	2.5	0	14	1.4	29	6
Cavity-Nesting Birds (CNB)	1	0	5	1	10	3
Long-legged Myotis (LLMY)	4		17	-	37	
Pygmy Nuthatch (PYNU)	1	0	6	2	12	4
White-headed woodpecker (WHWO)	0.5	0.5	2	2	4	4
Wouldiamson's sapsucker (WISA)	14	3	28	8	50	16
DecAID Inventory data for ponderosa pine (PPDF_S)	0	0	2.5	0	10.5	2.6
DecAID Inventory data for ponderosa pine (PPDF_L)	0	0	0	0	13.1	2.6
Current Direction for Ponderosa Pine[1]	***3***	***1***				
Lodgepole pine (3% of project area)						
Existing snag levels	0.1-0.5					
American marten (AMMA)	12	4	13	4	14	5
DecAID Inventory data for lodgepole pine (LP_S)	11.5	0	19.8	0	65.5	5.2
Current Direction for LP[1]	**6**	***N/A***				

1 Current Direction (Screens) is provided by habitat type and densities >10" and >20". It is not broken down into tolerance levels but rather represents a 100% biological potential which has been determined to be a flawed technique (Rose et al 2002). DecAID Inventory data is for unharvested plots with and without measurable snags for Lodgepole Pine Small/Medium Trees (LP_S), Ponderosa Pine Small/Medium

Trees (PPDF_S), and Ponderosa Pine Large Trees (PPDF_L) in tables inv-3b and inv-4b. Information is from Mellen-McLean et al. 2009.

[2]GIS layers identify 4 acres of mixed conifer within the proposed project area. However, on-site reconnaissance indicates that the area classified as mixed conifer does not currently include any overstory species other than ponderosa pine and lodgepole pine. Additionally, in 1988 the Paulina Fire killed all mixed conifer overstory in the GIS-identified patch adjacent to the proposed project area. Because this area is of such small size (<0.1% of the proposed project area) and <5 acres, and is not recognizable as mixed conifer, it has been treated as ponderosa pine (the adjoining PAG on GIS layers, and recognized in the field) for the purposes of this analysis.

Based upon the information provided in Table 3.4.4, the area is deficient in snags of both size classes in both ponderosa pine and in lodgepole pine plant associations. Current snags densities are providing habitat at the 30% tolerance level or below for most of the listed species. This is, in part at least, to be anticipated as per the earlier discussion regarding relative potential of dead wood being low-moderate reflecting the lower tolerance levels in this area, however, it also reflects on past management actions including heavy logging prior to Forest Service acquisition in 1934, and the effects of stand replacement wildfires.

In the three subwatersheds used for the analysis scale, snag levels are extremely low in large part due to the Paulina wildfire in 1988. Lodgepole pine snag longevity is considered 6 years for snags 10-11.9" dbh, and 8 years for snags larger than this. Within the three subwatersheds surrounding the proposed project area, a little over 5,400 acres are considered lodgepole pine plant association groups, and in 1988 over 3,000 acres of this was burned by a stand replacement fire. While a few of the snags created by this fire remain, they are over 20 years old and were not used in calculations of snag densities.

The existing low density of snags coupled with the importance of snags, especially large diameter snags, for many of the MIS species, emphasizes the need to retain all existing snags as possible in the planning area, as well as creating conditions that would favor the recruitment of large snags.

Using the studies and information within DecAID, it is entirely expected and realized that within this analysis area the distribution of snags would be clumpy (i.e. some areas have no snags while others have many snags). Since most of the planning area falls within the small/medium tree types, the clumps of snags would be expected to be small (2-5/acre) with the majority of these snags being less than 20" dbh. The large tree type would have more of the larger snags. The 2004-2009 Aerial Insect and Disease Survey maps show outbreaks of mountain pine beetle occurring in the project area, with over a thousand acres affected in 2009. The majority of these newly created snags (>80%) are lodgepole pine within ponderosa pine plant associations. These areas may provide the higher density clumps of snags utilized by some species (e.g. black-backed woodpeckers).

In comparing the existing data with the DecAID data, there is snag habitat being provided, but at lower levels than may be optimal for many MIS species. The planning area may be capable of providing more habitat than is currently present but is not likely to sustain habitat at the 80% tolerance level. Populations may remain limited due to the current availability of habitat. As management trends towards the historic range of variability and an increase in large ponderosa pine habitat, large clumps of dense small diameter snags as a result of beetle-kill or stand-replacing fire may become less common.

Existing Condition – Coarse Woody Material

In order to analyze downed log habitat and coarse woody material (CWM), two sources were used. DecAID was used to compare the average diameters of logs used by wildlife and distribution of CWM material over an area. Eastside Screens direction specifies pieces per acre of certain sizes to be retained according to habitat type. The following table (Table 3.4.5) compares the existing levels with these two measurements. Levels of existing downed wood were determined using log surveys in ponderosa pine plant associations in the associated three subwatersheds, and were supplemented by GNN data for the same area for both ponderosa pine and lodgepole line plant associations.

Table 3.4.5 Comparison of Existing CWM and Forest Plan Directed Levels* *

Habitat Type	Average diameter of CWM 10-20"	Density (pieces/ac) of CWM >10"	Average Diameter of CWM >20"	Density (pieces/ac) of CWM >20"	Percent Cover (Deschutes NF Data)
Existing Ponderosa Pine	13"	2.8	27"	0.7	0.7-1.4
Ponderosa Pine Direction	12	3-6	0	0	0.3-0.9
Ponderosa Pine Dry Forest DecAID level*	no data	no data	no data	no data	0.9-8.5
Existing Lodgepole Pine	no data	no data	no data	no data	1.5
Lodgepole Pine Direction	>8"	15-20	0	0	0.8-2.1
Lodgepole Pine Dry Forest DecAID level*	no data	no data	no data	no data	2.6-16

***The information for % cover levels from DecAID was taken from the inventory data. The ranges given reflect the 30-80% tolerance levels for all the structural stages.**

****Estimates of Percent Cover are Given in Order to Compare Deschutes NF Data with Information in DecAID**

Based on the Screens direction, the planning area is deficient in log densities. Total percent cover appears acceptable by forest standards, but low as compared with best available science (DecAID levels), even at the lower 30% tolerance. There are areas with high densities of clumped downed logs with up to 13% cover of down woody debris according to a GNN analysis of the subwatersheds. Both percent cover and density are shown in table 3.4.5. From an analysis standpoint percent cover is a more useful tool to describe coarse woody material. Forest Plan direction is based on density and the percent cover values are only rough conversions.

Existing Condition – Green Tree Replacements (GTRs)

8 GTRs/acre are required in ponderosa pine, and 23 GTRs/acre are needed in lodgepole pine in order to meet current direction

Green tree replacements are trees retained, or managed through time, to provide snag or CWM habitat at some point in the future. The treatment unit is the area of accountability for meeting GTR objectives (Deschutes National Forest Wildlife Tree and Log Implementation Strategy [WLTL], 1994), with the treatment unit defined as the area where management activities may potentially affect WLTL densities and distribution. The objective for treatment units is to provide patches of habitat, or GTRs in a distribution pattern suitable for home range needs of primary cavity excavators (WLTL 1994). According to the WLTL, green tree replacements do not need to be provided on every acre in the forested ecosystem. A mosaic distribution across the landscape maintaining viable populations and ecological functions is the desired condition. The desired condition is based on the assumptions that: 1) deficits or surpluses, whether natural or related to past management activities, would continue to be part of the landscape; 2) treatment units would be designed to meet WLTL objectives each entry or treatment; and

3) that some treatment units would not provide WLTLs due to preference given to other resource issues. The Eastside Screens direction requires all sale activities (including intermediate and regeneration harvest in both even-age and uneven-age systems, and salvage) to maintain GTRs of >21 inches dbh, or the representative dbh of the overstory layer if less than 21 inches, at 100 percent maximum potential population levels (MPP) of primary cavity excavators. As shown in Table 3.4.4, this 100% MPP was estimated to be 4 snags/acre for ponderosa pine habitat types and 6 snags/acre for lodgepole pine habitat types. Formula 2 for GTR's with a 20-year interval between treatments suggests 8 GTRs are needed in ponderosa pine and 20 GTRs/acre are needed in lodgepole pine. These numbers are higher than the required snags/acre needed to meet maximum potential population because it takes more green trees in order to generate the required number of snags and meet current forest plan direction. In comparison of the wildlife data in DecAID, maintenance of the directed levels of GTRs would likely manage for future snags at the 30-50% tolerance levels for most wildlife species.

Direct and Indirect Effects—Snags, CWM, and GTRs—Alternative 1

The No Action alternative would maintain snag, CWM and green tree replacement habitats in the current condition during the short-term (<20 years). Natural disturbances such wildfire, wind events, insect and disease pathogens, and lightning would continue to recruit snag and CWM habitat through time in the planning area. However, high tree density in some of the ponderosa pine stands would slow the development of large diameter (>21") ponderosa pine trees and future large diameter snags. These high tree densities have made stands more vulnerable to death from bark beetles and fire, which would likely result in the development of smaller diameter snags and CWM. This would, at least in the short-term, benefit MIS cavity-nesting species that utilize smaller snags for nesting and/or foraging opportunities. Large snags and downed logs would continue to be limited and those species that select for these habitat components (e.g. black bear, marten, bats, white-headed woodpecker and Wouldiamson's sapsucker) would continue to have limited populations within the planning area. Because these dense stands are more vulnerable to stand-replacement fires, these limited habitat features are at risk. If a high intensity wildfire did burn through the planning area, habitat for many of the MIS species which depend on large diameter snags would not develop. FVS simulations indicate that without treatment and without stand-replacement fire, there could be over 8 snags per acre greater than 10" dbh but only 0.3 per acre greater than 20" dbh in 30 years. However, if untreated, stand replacement fires could occur during this time period, making snag levels much higher on a short-term basis, but much lower in the long-term.

Direct and Indirect Effects—Snags, CWM, and GTRs—Alternative 2

Under alternative 2, snags would be removed. Snag densities are currently below direction within both ponderosa pine and lodgepole pine plant associations in the surrounding watersheds, but within the stands in which salvage harvesting is proposed, snag levels are above the minimum required by the screens. All ponderosa pine snags, and enough snags to meet Forest S&Gs would be maintained within those stands.

For most of the planning area where salvage logging is not proposed, only snags considered a safety hazard would be removed and underburning prescriptions would be designed to keep the loss of snags to a minimum. However, some would certainly be lost and some would be created. The largest short-term impact on snags would be the salvage harvest that would occur on 857 acres. Ten percent of this area would be retained in wildlife leave areas leaving 771 acres of actual salvage harvest under alternative 2. While this would have a big effect locally at the scale of the planning area boundary, snags are analyzed across three subwatersheds totaling 71,718 acres. The salvage logging acres in this alternative represent one percent of this total area. Snag surveys suggest that current snag densities in these stands are higher than required under the forest plan. However, within the planning area snag densities are very low, and some species, such as black-backed woodpeckers, Wouldiamson's sapsuckers and long-legged myotis, are typically associated with snag levels even higher than those present in the area proposed for salvage. Further, it is important to have spatial heterogeneity in the distribution of snags across the landscape. Based on the distribution of snags on unharvested inventory plots (Mellen-McLean et al. 2009), some areas would have zero snags, while

others would have very high densities. Species that require these higher densities would be negatively affected by the proposed treatments. In addition to reducing snags the proposed salvage treatments under alternative 2 would also reduce the amount of CWM in the next 10 years.

FVS simulations indicate that in 30 years, larger size snag densities would increase under all alternatives to approximately 0.3 per acre in treated units, but smaller diameter snags (10-20" dbh) would be rarer. In both alternatives 2 and 3, smaller size snag densities of 2-2.5 per acre are anticipated in 30 years. FVS simulation does not include tree mortality due to wildfire and prescribed fire, however, so these numbers should actually be higher. On Deschutes National Forest Ecology Plots, prescribed burning created an average of 1 snag per acre greater than 10" dbh, and stand replacement wildfire would create considerably more. 82% of the Flank area is slated to be underburned with alternative 2. Underburning would not be accomplished for several years post harvest so these snags might not be provided for 5-7 years.

Current levels of CWM within the proposed project area are also below Forest S&Gs, although on several units they are in excess of minimum levels. Project design criteria require retaining at least 3-6 logs/acre >12" diameter at the small end in ponderosa pine habitats and at and at least 15-20 logs per acre >8" diameter at the small end in lodgepole pine habitats (Screens Direction). Only lodgepole pine logs exceeding these levels on salvage units would be removed, however since the entire project area is currently deficient, this alternative would create an even greater deficiency.

CWM would also be further reduced, at least in the short-term, by prescribed fire. However, mortality from prescribed fire and within high-density wildlife retention areas would ultimately increase CWM levels, although at a much lower level than alternative 1.

Under both alternatives 2 and 3, for most units, thinning is occurring from below, and tree densities would remain high enough to provide GTR levels as required by the Forest Plan. In 8 units, overstory removal of lodgepole pine would occur, however, all ponderosa pine would be left. In 3 of these units (53, 84, and 88), there would not be enough large trees to provide sufficient GTRs without creating GTR retention areas. GTR retention areas, in addition to the standard wildlife retention areas, were designed to ensure that Forest Plan requirements would be met.

Table 3.4.6 Summary of Effects to Snags by Alternative

Timeline	Alt 1	Alt 2	Alt 3
Short Term (0-10 yrs)	• S&Gs not currently being met • S&Gs would be met in 10 yrs for small diameter snags • no short term impacts to large diameter snags • large diameter snag densities remain low	• S&Gs not currently met • small diameter snag densities reduced by salvage logging • small diameter snag recruitment is slowed • no short term impacts to large diameter snags • large diameter snag densities remain low	• S&Gs not currently being met • no short term impacts to small diameter snags • small diameter snag recruitment is slowed • no short term impacts to large diameter snags
Long Term (11-30 yrs)	• small diameter snags become abundant (>8/acre) • large diameter snags remain below S&Gs (30 yrs).	• small diameter snags remain below S&Gs (20-30yrs) • fires could result in meeting S&G's sooner • large diameter snags remain below S&Gs (30 yrs).	• small diameter snags remain below S&Gs (20-30yrs) • fires could result in meeting S&G's sooner • large diameter snags remain below S&Gs (30yrs)

Direct and Indirect Effects—Snags, CWM, and GTRs—Alternative 3

Under this alternative, only snags considered a safety hazard would be removed and underburning prescriptions would be designed to keep the loss of snags to a minimum. However, some would certainly be lost and some would be created. Thinning prescriptions are designed to reduce the stress on remaining trees, making them more resilient to insects, disease, and fire. As a result, there would be a lower rate of snag recruitment over time. However, these same treatments would result in larger trees over time, which would ultimately provide recruitment of larger diameter snags. Overstory removal would be the same under alternative 3 as alternative 2. By improving forest health, there would be fewer areas of dense small diameter snag creation in both the short-term and in the long-term. In both alternatives 2 and 3, smaller size snag densities of 3-3.5 per acre are anticipated in 30 years, with alternative 3 providing slightly higher snag levels than alternative 2.

Current levels of CWM within the proposed project area are also below Forest S&Gs, although on several units they are in excess of minimum levels. CWM would be further reduced, at least in the short-term, by prescribed fire. However, mortality from prescribed fire and within high-density wildlife retention areas would ultimately increase CWM levels to levels higher than alternative 2, but at a much lower level than alternative 1.

As stated under the effects section for alternative 2, in both alternatives 2 and 3, thinning is occurring from below, and tree densities would remain high enough to provide GTR levels as required by the Forest Plan. In units with overstory removal treatments, all ponderosa pine would be left, 10% wildlife retention patches would remain untreated, and where tree densities would fall below required by the Forest Plan for GTRs, additional retention areas, were designed.

Cumulative Effects—Snags, CWM, and GTRs

Cumulative effects were analyzed for Forest Service land at the 6th field subwatershed level which includes Horse Ridge, Hunter and Tepee Draw subwatersheds for a total of 71,718 acres. This is a commonly used scale because it reflects larger scale landscape issues as they impact wildlife, while remaining small enough to evaluate the impact on individual populations of snag dependent species. Proposed, current, past, and foreseeable actions include continued fuels treatments, timber stand improvement, firewood collection, and salvage logging (see Table 3.1). The proposed project area is not currently meeting forest plan standards and guides in large part due to these past actions. In the short-term, alternative 2 would further reduce smaller diameter snag and CWM levels. In the long-term, both alternatives 2 and 3 would result in lower snag and CWM levels than alternative 1, however, on the subwatershed scale forest standards and guides for smaller diameter snags and CWM would be met in the long-term (>20 years). Large diameter snags would continue to be below forest standards and guides in the long-term, but on the subwatershed level the treatments associated with the action alternatives would result in a difference of less than 0.05 snags per acre.

3.4.7 Late Old Structure and Old Growth Management Areas –Travel Corridors

In the majority of the project area, treatments are designed to move stand conditions towards LOS.

Existing Condition —— Late Old Structure and Old Growth Management Areas – Travel l Corridors

There is no previously designated/mapped Old Growth Management Area (OGMA) nor are there late and old structural (LOS) stands within the project area. While there are individual and small clusters of trees with old growth characteristics, there are no stands that meet the definition of Late Old Structure within the planning area (Hopkins 1992, and Hopkins et al 1992). The individual trees with old growth characteristics are in densities of less than 12 per acre and in stands smaller than 10 acres (R6 Interim Direction Hopkins 1992 uses 10 acres as a cutoff for late old structure).

A minimum of two connectivity corridors to link LOS and/or OGMA stands are required by the Eastside Screens to provide for wildlife movement. One designated OGMA stand is southeast of the project area and the other is to the southwest. Two connectivity corridors in the project area were linked together where practical. The eastside screens also promote structural stage 6 (multi-stratum with large trees) and structural stage 7 (single stratum with large trees). As shown in the HRV existing conditions section, there is a lack of these two stages in the planning area. These structural stages are important for promoting quality habitat structure for many species, such as bats, songbirds, raptors, and big game. These structures are important because they provide nesting, roosting, foraging and movement (travel) opportunities.

Direct & Indirect Effects — Late Old Structure and Old Growth Management Areas – Travel Corridors –Alternative 1

As shown in the HRV analysis for Alternative 1, this alternative would not meet the objectives for promoting large trees. Therefore, there would be a lack of quality habitat for many species.

Direct & Indirect Effects — Late Old Structure and Old Growth Management Areas – Travel Corridors Alternatives 2&3

The Eastside Screens require maintaining or enhancing the connectivity between LOS/OGMA stands by at least two different directions. The most practical areas to connect the two OGMA stands occur in the southern and western flank of the project area (see Appendix for map). Alternatives 2 or 3 would make connectivity from the two OGMA stands and would occur in Units 13, 19, 29, 30, 46-48, 68, 82, 87, and 88 through commercial thinning, precommercial thinning, and overstory tree removal; corridors should be at least 400 feet wide at their narrowest point. The main difference between the two alternatives would be salvage harvesting would only occur under Alternative 2 in units 13, 19, 48, and 87 due to the high beetle mortality occurring in lodgepole and black bark ponderosa pine. The remaining units largely contain smaller diameter trees. Alternatives 2 or 3 would affect units as described above, but would be moving toward desired conditions for larger trees. These corridors have been recorded in GIS and would be maintained for future protection. Overall, either alternative would improve the connectivity corridor, but Alternative 2 would be most effective by minimizing the spread of beetle mortality. Because stand treatments would maintain tree cover in the upper third of potential tree stocking, there is no need to change or alter prescriptions to create connectivity corridors.

The most applicable guidelines in relationship with the Flank EA would be Interim wildlife standard 6d Scenario A, 3a (1-4). These would be met through Alternative 2 or 3 because medium diameter or all remnant late and old seral live trees greater than 21 inches would be maintained within the top one-third of site potential in proposed harvest units, the two OGMA stands outside of the project area would connect, and a corridor of at least 400 feet wide would be provided.

Cumulative Effects--- Late Old Structure and Old Growth Management Areas –Travel Corridors

Late old structure and Old Growth Management area travel corridors were analyzed at the local scale based on Eastside Screens direction (see existing condition under 3.4.7). Table 3.1 of past, present and reasonably foreseeable future actions was analyzed and there are no activities that would affect late old structure or old growth management areas in the project area. The effects of Alternatives 2 and 3 would begin developing a travel corridor to connect the two OGMA stands outside the project area. Because stand treatments would maintain tree cover in the upper third of potential tree stocking, there is no need to change or alter prescriptions to create connectivity corridors. The most applicable guidelines in relationship with the Flank EA would be Interim wildlife standard 6d Scenario A, 3a (1-4). These would be met through Alternative 2 or 3 because medium diameter or all remnant late and old seral live trees greater than 21 inches would be maintained within the top one-third of site potential in proposed harvest units, the two OGMA stands outside of the project area would connect, and a corridor of at least 400 feet wide would be provided.

3.4.8 Special or Unique Habitats

The forest plan stipulates that habitat for species associated with springs, seeps, cliffs, and talus slopes would be protected during project development. There are a few rock outcroppings, some forested lavas, one sagebrush-dominated slope, and two human-made guzzlers within the project area. Project Design Criteria (PDCs) listed in chapter 2 specify protection measures for these sites. All sites would be maintained and long term productivity would be increased. Standards and Guidelines addressing special or unique habitats are being met.

3.4.9 Management Indicator Species

Management Indicator Species (MIS) analyzed in this section include Woodpeckers, Big Game, Northern Goshawk, Cooper's hawk and Sharp-shinned hawk and the Red-tailed hawk because the project area provides habitat for these species. Townsend's big-eared bats are analyzed in the bat section. See tables 3.4.1, 3.4.2., and 3.4.3 for species lists along their status, habitat use, NatureServe ranking, and potential presence within the proposed project area.

Woodpeckers—Existing Condition

A variety of woodpecker species have habitat within or adjacent to the proposed project area, including three-toed woodpeckers, Wouldiamson's sapsuckers, northern flickers, hairy woodpeckers, and black-backed woodpecker. There is also habitat or potential habitat for Lewis' woodpeckers and white-headed woodpeckers, which are both on the Regional Foresters Sensitive Species List.

White-headed woodpecker

White-headed woodpeckers utilize both live and dead ponderosa pines. They are cavity nesters, and typically use large snags, particularly ponderosa pine. These woodpeckers are poor excavators and generally select for a more moderately decayed or softer snag in which to nest (Dixon 1995). They nest in snags with a dbh of over 26 inches, and primarily forage in the bark of trees that are larger than 24" dbh (Lewis and Rodrick 2002). Pine seeds are a major part of their diet, comprising approximately 60% of their diet throughout the year. The rest of their diet is insects. They would forage on both live and dead pines, and select the large diameter live pines which have more seeds. Having large ponderosa pine does not assure this species' presence, however, and indications have been made that a well-developed overstory of trees and shrubs may encourage mammalian predation on nests (Marshall 1997). White-headed woodpeckers are absent from early seral ponderosa stands. They are however abundant in burned or cut forests where residual large-diameter live and dead trees remain (Garrett et al. 1996, Raphael et al. 1987). Habitat for white-headed woodpeckers is currently limited within the project area due to the lack of climax ponderosa pine associations. There are a few large ponderosa pines in the proposed project area and so potential but low-quality habitat is present. The majority of the project area has the potential to become high-quality white-headed woodpecker habitat in the future. White-headed woodpeckers are listed as imperiled/vulnerable by NatureServe.

Lewis' woodpecker

The Lewis' woodpecker is generally characterized as a "burn specialist" due to its preference for nesting in burned pine forests (Saab and Vierling 2001), particularly in forests that were open and dominated by large trees prior to burning. It is also associated with open forests, typically in Oregon white oak, ponderosa pine, and riparian cottonwood communities. The important components of breeding habitat include an open woodland canopy and large-diameter dead or dying trees. They reuse existing nest holes excavated by other woodpeckers such as the northern flicker and hairy woodpecker, and these trees are typically large diameter and in an advanced state of decay (Tobalske 1997, Marshall et al. 2006). It is an opportunistic feeder, primarily feeding aerially on insects in the spring and summer and on fruits and acorns in fall and winter (Marshall et al. 2006, Abele et al. 2004). Although a year-round resident of Oregon, Lewis' woodpeckers do not overwinter in our area. There have been no recent stand replacement fires within the project area, but there are suitable areas adjacent to it, and

stand replacement fires could occur within the project area in the near future. Lewis' woodpeckers are also known to use open ponderosa pine forests to a lesser extent. The project area is comprised of both open and closed canopy blackbark ponderosa pine forest, and some of this habitat could be utilized. In addition to being on the Regional Forester's list of sensitive species, the Lewis' woodpecker is identified in the Conservation Strategy for Landbirds of the East-Slope of the Cascades Mountains in Oregon and Washington as a focal species for Ponderosa Pine Forests with patches of burned old forest (Altman 2000). Lewis' woodpeckers are listed as imperiled/vulnerable in Oregon by NatureServe.

Northern flicker

Potential habitat for this species is any plant association with large trees. The project area is mostly smaller diameter second growth, but there are a few larger diameter second-growth ponderosa as well. Northern flickers are perhaps the most common woodpecker resident in Oregon. They can be found in a range of terrestrial habitats, but are generally abundant in open forests and forest edges adjacent to open country (Marshall et al. 2006). As a large cavity nester (12.5 inches long according to Sibley 2005), northern flickers require large snags or large trees with decay in order to build their nests. Northern flickers require forest openings, and may benefit from human-caused changes (Marshall et al. 2006). This species is listed as secure in Oregon by NatureServe.

Hairy woodpecker

Hairy woodpeckers prefer open stands and frequently utilize burns. The entire project area functions as potential habitat. Although found in virtually any forested area in Oregon, hairy woodpeckers are most common in lodgepole and ponderosa pine and mixed conifer habitats. They are found in mature stands and utilize snags greater than 10 inches in diameter for nest and forage sites, prefer nesting in trees over 100 years old (Marshall et al. 2006). This species is listed as apparently secure in Oregon by NatureServe.

Downy woodpecker

The proposed project area is considered low quality habitat, but since woodpeckers sometimes utilize ponderosa pine forests, they may be present in the project area. The entire project area is considered possible habitat, but of low quality. North America's smallest woodpecker, the downy woodpecker is found in deciduous, mixed deciduous-coniferous forests, and occasionally coniferous forests. It prefers deciduous forest in riparian areas, usually nests in decayed snags, and feeds primarily on insects. They are occasionally found in ponderosa pine (Gabrielson and Jewett 1940, Pedersen and Bryant 1975, Gashwoulder 1977 [Marshall et al. 2006]). NatureServe lists downy woodpeckers as apparently secure in Oregon.

Wouldiamson's sapsucker

The project area has few large trees, and even fewer large snags, but nonetheless offers low quality habitat. The Wouldiamson's sapsucker is highly adaptable and uses a variety of coniferous forest types, and most often breeds in ponderosa pine forests. A weak excavator, they require forests with large injured or dead trees for nest cavities. They feed on a diet of conifer tree sap, phloem fibers, cambium, and insects. Wouldiamson's sapsuckers are highly tolerant of human disturbance, and tolerate human disturbance even of nest sites (Dobbs et al. 1997). In Oregon NatureServe lists the breeding population as apparently secure while the nonbreeding population is listed as vulnerable.

Black-backed woodpecker

There is currently habitat within the project in areas with recent beetle kill, and a black-backed woodpecker was observed in Unit 31. This unit would not be treated under any of the alternatives. The black-backed woodpecker is mostly found in areas with large wood-boring beetle outbreaks, and are most frequent in recently burned over coniferous forests. They are typically only present for the first few years following heavy tree mortality before moving to a new area. In Oregon they are most frequently

associated with recently dead lodgepole pine (Dixon and Saab 2000). They are quick to utilize recent burns, but only for the first few years following a fire (NatureServe 2009). NatureServe lists this species as vulnerable in Oregon.

Three-toed woodpecker

Habitat conditions within the project area are not currently suitable for this woodpecker, but could develop in the future as trees continue to die from pine beetle attacks, or should a stand replacement fire occur. They require dense coniferous forests with high numbers of snags, and in central Oregon are most frequently seen in lodgepole pine forests. They benefit from stand replacement fires and insect outbreaks, with populations typically increasing 3-5 years post-fire, often following the use of these areas by black-backed woodpeckers (NatureServe 2009). NatureServe lists this species as vulnerable in Oregon.

Direct and Indirect Effects– Woodpeckers –Alternative 1

Under this alternative, large stand replacement fires are the most likely, which would benefit species that utilize smaller diameter snags such as black-backed and three-toed woodpeckers, at least in the short term. Similarly, dense forest conditions should continue to result in large areas of beetle-kill, mostly of the smaller diameter trees which dominate the project area, but also of the few large diameter trees that are present. Under this alternative, stand-replacement fires and insect and disease outbreaks are likely, and due to the homogeneously dense conditions of much of the project area, the area impacted would be likely to be very large.

Direct and Indirect Effects– Woodpeckers –Alternative 2

Under alternative 2, species that require large diameter trees or snags would ultimately benefit from treatments, since large diameter trees and snags would not be removed, and treatments would promote the growth of larger diameter trees. Both Lewis' woodpeckers and white-headed woodpeckers are on the Regional Foresters Sensitive Species list, and both of these species benefit from more open stand conditions with larger size structure, which is the type of habitat being managed for under alternative 2. White-headed woodpecker habitat in particular is being promoted, and while larger size structure would take years to develop, it would develop more rapidly under alternative 2 than alternative 1. Alternatives 2 and 3 would both benefit both of these species. Species that prefer smaller size snags, such as the black-backed woodpecker and three-toed woodpecker, would be negatively affected. Areas likely to be killed by stand replacement fires or insect outbreaks would be made more resilient, and therefore fewer areas of dense snags would be created for these species. In addition, salvage logging on approximately 770 acres would remove smaller diameter snags, which these species require. Species such as black-backed woodpeckers and three-toed woodpeckers that require high densities of small diameter snags would be negatively impacted by thinning and by salvage treatments. All large tree and snags, and logs of all size classes would be retained, however, so species which utilize these larger size classes, such as Wouldiamson's sapsuckers, would be less affected. Additionally, the 10% retention areas left unthinned would provide habitat for with both large and small snag size classes. Thinning treatments would also have a long-term negative impact on smaller snag levels, however, habitat would be made more stable with smaller patches of dead trees developing over time. This should provide more stable habitat conditions— rather than resulting in insects, disease, and fire creating large areas with high snag densities on a very infrequently basis, smaller patches would be created more frequently. This alternative should increase large diameter snag densities over the very long-term; trees would grow more rapidly due to thinning, but would also be less likely to die due to decreased stress from competing neighbors. Alternative 2 would benefit Northern flickers, hairy, white-headed and Lewis' woodpeckers and Wouldiamson's sapsuckers, have little or no effect on downy woodpeckers, and negatively affect black-backed and three-toed woodpeckers.

Direct and Indirect Effects– Woodpeckers –Alternative 3

The effects of alternative 3 would be similar to those under alternative 2, but would have a smaller negative short-term impact on all species because there would be no salvage harvesting, and less total area would be treated. Because some areas would be left in denser conditions, these areas would be more vulnerable to fire and insects, and if killed by insects or fire, would result in denser stands of snags which would benefit species such as black-backed woodpeckers and three-toed woodpeckers. The potential habitat creation for these species is greatest under the no action alternative however. Otherwise, the effects would be similar, with an overall reduction in small diameter snags, greater long-term stability of habitat and habitat creation, and the development of the larger diameter trees and snags preferred by some woodpeckers. The impacts of alternative 3 on white-headed woodpeckers and Lewis' woodpeckers should be similar to those under alternative 2. Alternative 3 would benefit Northern flickers, hairy, white-headed and Lewis' woodpeckers and Wouldiamson's sapsuckers, have little or no effect on downy woodpeckers, and benefit affect black-backed and three-toed woodpeckers. The negative impacts under this alternative would be less than for alternative 2.

Cumulative Effects– Woodpeckers

Cumulative effects for these woodpecker species were analyzed for Forest Service land at the 6th field subwatershed level which includes Horse Ridge, Hunter and Tepee Draw subwatersheds. This is a commonly used scale because it reflects larger scale landscape issues as they impact wildlife, while remaining small enough to evaluate the impact on individual populations. Cumulative effects were analyzed for the actions listed in table 3.1. Past management actions have generally resulted in a decrease in snags and downed wood. Routine hazard tree felling, and hazard tree felling in conjunction with projects also results in a reduction of all sizes of snags, and many woodpecker species have been negatively impacted. Ongoing restoration projects and firewood collection are also resulting in a reduction of small diameter snags, however, large size snags are being promoted. Restoration projects are also resulting in an increase in stand stability and the long-term development of large diameter snags, which would ultimately benefit most species. The ongoing suppression of wildfire initially had a highly negative impact on species such as black-backed, and three-toed woodpeckers which depend on stand-replacement events to create new habitat. As fuel loads have increased, large scale stand-replacement events have become more common and are resulting in an increase in habitat for these species. Nature Serve lists Lewis's woodpeckers and white-headed woodpeckers as the two most at risk species of the woodpeckers present or potentially present within the proposed project area, and the action alternatives would be most beneficial to these two species, which are discussed in more detail in the Biological Evaluation for this project. Habitat alteration would occur on less than 10% of the cumulative effects bounding area. The alteration would be beneficial for the white-headed woodpecker and the Lewis' woodpecker. However, habitat manipulations would move conditions towards those more desirable for these two species, but would not immediately create quality habitat due to the need for larger trees which would take years to grow. Habitat for black-backed woodpeckers and three-toed woodpeckers within the proposed project area is currently very limited. Proposed treatments would open up some of the denser forest conditions, which are more vulnerable to insects, disease, and fire. Altering 10% of the 6th field subwatershed level would have a negligible effect on these species. Based on this, the project would not contribute to an overall downward trend in species viability for woodpeckers at the forest level.

Management under both action alternatives would be especially beneficial to white-headed woodpeckers, which are discussed in more detail in the Biological Evaluation for this project.

All of these woodpecker species are snag dependent. The proposed project area is not currently meeting forest plan standards and guides for snags in large part due to past actions. On the short-term, alternative 2 would further reduce smaller diameter snag levels. In the long-term, both alternatives 2 and 3 would result in lower snag levels than alternative 1, however, on the subwatershed scale forest standards and guides for smaller diameter snags would be met in the long-term (>20 years). Large diameter snags would continue to be below forest standards and guides in the long-term under all three alternatives, but on the subwatershed level the difference between these 3 alternatives should be a

difference of less than 0.05 snags per acre. However, although small-scale habitats may not have much effect on total snags/acre across a larger watershed, snag habitat is typically clumpy, and, for some species, a dense clump of snags is more valuable habitat than scattered individual snags.

Management Indicator Species – Big Game

Introduction –Big Game

Deer and elk are habitat generalists with the ability to utilize various nutritional sources and thus can be found using nearly every habitat. Certain preferences however, do exist and not all attributes of a given habitat association are of equal importance. As described by Towry (1984) both deer and elk have three broad habitat requirements: rearing, feeding, and cover.

The project area does not *biologically* provide all three habitat components for deer because there are no riparian areas within or adjacent to the project area. However, fawning and rearing does occur and there are resident deer populations that occupy the area year-round. The wildlife guzzlers in the project area and within the broader area provide most of their water source. Forage and cover for elk are available, but there is also no rearing habitat for calving. Elk use is primarily during spring and fall, in transition to winter range and for higher elevation calving and foraging grounds. Mule deer and elk are classified as Management Indicator Species (MIS) in the Deschutes LRMP. Pronghorn antelope do not utilize summer range in the project area, and seldom use the small portion of winter range in the project area. Antelope mostly winter further east and south in the broader primary winter range areas. Pronghorn antelope have no specific designation under the LRMP.

Analysis Methods – Big Game

Hiding cover was calculated through GIS modeling using GNN and satellite data from 2006 and then field verified by using the concepts under LRMP WL-54. The concepts include the following parameters: hiding 90% of a standing adult from view of a human at a distance of 200 feet.; trees with a density of at least 469 trees/hectare (190 trees/acre or a tree every 15 ft) with a dbh of 3-25 cm (1-10 in.) and at least 2m (7 ft) tall, including cover patch size greater than or equal to 6 acres. All data that did not fit these criteria was not given hiding cover status. GNN fields used to produce this data were TPH_3_25 (density of live trees 2.5-25 cm dbh trees/ha) and STNDHGT (stand height).

Existing Condition – Big Game—Summer Range

The LRMP describes deer summer range as the entire Forest outside Deer Habitat Management Areas or also known as deer winter range (Management Area 7 or MA7). MA 7 habitat would be discussed in more detail in the Big Game Winter Range Section below. The LRMP designates key elk areas (KEA), which may include summer, winter and calving areas. The proposed project area primarily consists of mule deer summer range (77%).

LRMP direction for managing deer hiding cover in summer range is to retain at least 30% of non-black bark pine stands on National Forest lands in each implementation unit (IU) (WL-54). Hiding cover is defined as stands 6 acres or larger capable of hiding 90 percent of a standing adult deer or elk from view of a human at a distance equal to or less than 200 feet (Thomas 1979). Hiding cover provides security to big game and protection from predators. Hiding cover is especially important for reducing vulnerability to hunting and poaching pressure by providing concealment in areas that have high open densities and easy access by hunters. The LRMP describes black bark pine stands generally as 50 to 80 year old ponderosa pine stands and is not part of the 30% conformance in each IU. Implementation units are numbered and are large areas generally bounded by roads. The Flank project area is within IUs 47 and 50 (see Figure 3.1).

Table 3.4.7 shows the existing acres and percentages of hiding cover in non-black bark pine stands in each IU 47 and 50. IU 47 is currently at 56.6% and is meeting the 30% requirement. IU 50 is currently at 22.5% and not meeting the requirement. The combination of low site productivity (i.e. dominated by xeric, low elevation ponderosa pine, and an average of 15 inches of precipitation), lack of

open mature pine stands and lack of regeneration due to previous timber harvests all contribute to the low quantity and quality of hiding cover present.

Table 3.4.7 Existing Deer Hiding Cover in Summer Range by IU

Implementation Unit	Percent hiding cover in non-black bark pine (%)	Total non-black bark pine (acres)	LRMP Direction For Hiding cover (%)
47 (30,922 acres)	56.6	12,056	30
50 (31,428 acres)	22.5	16,655	30

The LRMP requirement for treating black bark pine in a project area and within deer summer range is to retain 10% of treated stands in clumps throughout the individual units (LRMP WL-59). Many of these clumps were identified on the ground and mapped in GIS, and in conjunction with WL-58 (leaving narrow strips of trees along roads to reduce view distances). The remaining clumps would be identified and marked prior to project implementation. It is assumed that hiding cover in summer range would meet any thermal cover requirements by mule deer (LRMP WL-57). GIS modeling and field verification of the project area indicates more than 5,000 acres of the project area are classified as black bark pine stands.

Existing Condition –Big Game—Winter Range

The project area is not within or adjacent to any LRMP designated key elk area. It is unlikely that elk use the small portion of deer winter range in the project area due to the high levels of road density and OHV trails (i.e. the 18 Road remains open during the seasonal wildlife closure for the Opine Travel Management Area). The 18 Road runs north to south through the entirety of the project area and receives high use, especially during low snow level years. Elk have an extremely low tolerance for motorized vehicles.

There are approximately 1,327 total acres (23%) of deer winter range (MA7) in the project area, which is part of the adjoining 11,673-acre Tepee Draw Winter Range Habitat Unit (WRHU). WRHUs were developed in 2001 in cooperation with the Oregon Department of Fish and Wildlife (ODFW) in order to better assess habitat conditions for mule deer in relation with their home range size on winter range(s). The LRMP does not require the use of IUs for analyzing habitat in Deer Habitat MA7, but suggests a minimum habitat assessment area of 3,000 acres (LRMP M7-11). The Tepee Draw WRHU was used to assess hiding and thermal cover.

The LRMP objective in designated MA7 is to manage the vegetation to provide optimum habitat, while considering the inherent productivity of the land. Herbaceous vegetation would be managed to provide vigorous forage base with a variety of forage species available and improved where conditions are poor. The LRMP recommends that cover and forage areas should be in close proximity for optimum use by big game, with cover making up 40% of a winter range area (approximately 30% should be thermal cover and 10% as hiding cover). Crown cover greater than 40% with trees 30 feet tall is recommended for thermal cover on the Forest (LRMP M7-13).

Table 3.4.8 shows the existing percentages of hiding and thermal cover in the Tepee Draw WRHU. Hiding cover is slightly above the desired condition, while thermal cover is well below. Field reconnaissance revealed that a large percentage of trees are experiencing bark beetle infestations, and would further continue to spread and stress the remaining live trees. Considering the inherent low productivity of this area, these cover requirements are unrealistic in low productivity ponderosa pine sites and are generally unattainable or sustainable, however growing stands at the upper 1/3 of potential is realistic. In addition, it would be very difficult to quantify 30% thermal cover for the following reasons: 1) 5,576 acres or 48% of the land in this WRHU are not suitable for timber production, 2) field reconnaissance of the area concluded that thermal cover is limited because it occurs in scattered patches of denser trees, which is primarily due to the low precipitation in the area.

Table 3.4.8 Existing Cover in the Tepee Draw Winter Range Habitat Unit

Type of Cover	(%)	LRMP Direction (%)
Hiding cover	14	10
Thermal cover	17	30

The LRMP guidance for forage is to design treatment units to 300-500 acres including un-manipulated islands. If more than one unit is treated in a single year, treatment units should be 600 to 1,200 feet apart (M7-15). Burning prescriptions would provide for the reestablishment of bitterbrush within 20 years, while only 2.0-2.5% burned annually. Additional shrub recommendations are found in the Deschutes National Forest Integrated Natural Fuels Management Strategy (USDA 1998). The desired condition for bitterbrush habitats in the planning area is to have a ratio of 1/3rd in early seral, 1/3rd in mid seral, and 1/3rd in late seral (late and decadent) habitats. Additional direction to manage forage conditions is through a 2001 Memorandum of Understanding (MOU) between the Deschutes National Forest and ODFW. The intent is to leave a proportion of shrub cover in MA7 in the 40-50% range. Based on field reconnaissance, these conditions are unattainable in certain areas at the current time because they do not exist due to tree stocking levels, but would likely increase within the short term after silvicultural treatments. There is a large proportion of the existing bitterbrush in the Tepee Draw WRHU in the late seral age class, followed by mid seral, and early seral. Adequate amounts of high quality forage are critical to deer on winter ranges. The condition of does is very important for fecundity and the health of fawns. Although older shrubs have value to many species, they are also at greater risk to loss from catastrophic fire, particularly if in large contiguous blocks.

Existing Condition –Big Game—Open Roads and Motorized Trails

Open roads and motorized trails adversely affect habitat effectiveness for big game due to disturbance (Wisdom tech. ed. 2005). In addition, it makes them more vulnerable during the hunting seasons, including poaching. Habitat fragmentation and loss of core habitat areas are other adverse impacts from open roads and trail densities.

LRMP direction manages open road densities in deer summer range at 2.5 miles per square mile (p/sq mi) in each IU and 1.0-2.5 miles p/sq mi in MA 7 Deer Habitat (winter range). Winter ranges should be evaluated individually and more carefully than summer ranges (Thomas 1979). Winter range provides the critical need for deer during winter and they do not distinguish between vehicles or off highway vehicles (OHVs).

Table 3.4.9 shows the existing open road density, including motorized trail density in each IU and in the Tepee Draw WRHU. Each IU 47 and 50 is exceeding the 2.5 miles p/sq mi guideline in summer range, while the road density is exceeding in the Tepee Draw WRHU.

Table 3.4.9 Existing Open Road and Motorized Trail Densities

Area	LRMP Direction (miles/sq. mile)	Open road Density (miles/sq. mile)	Motorized trail Density (miles/sq. mile)
IU 47 (summer range)	2.5	2.68	0.54
IU 50 (summer range)	2.5	2.90	0.74
Tepee Draw (winter range)	1.0-2.5	4.27	2.0

As part of mitigation for deer disturbance during the hunting seasons, there is a seasonal road closure through the Cooperative Travel Management Area or Green Dot System in the broader area of

the Flank EA project area. This system was designed to mitigate the impacts to mule deer on four different WRHUs, including a portion of the Tepee Draw area. Approximately 1.36 miles of Tepee Draw are seasonally closed under the Green Dot System. Additional mitigation resulted from the Opine EA by enforcing two District Special Orders, or also known as the Opine Travel Management Area. These orders require seasonal road closures from December 1st to March 31st. The entire Tepee Draw WRHU is within this closure area, closing approximately 20 miles of roads to improve habitat effectiveness.

Direct and Indirect Effects – Big Game – Alternative 1

Since elk use in the project area is minimal and only used in transition, the focus of the analysis is on mule deer due to their common use of the area. There would be no decrease in hiding or thermal cover in summer or winter range, but without forest health treatments the risk of catastrophic wildfire would increase in the future placing cover at risk over potentially large areas of the landscape with a resulting recovery time of years if not decades (i.e. the Skeleton, Evans West, and Paulina Fires). The quality and diversity of browse (shrubs) would continue to decrease as they become more decadent due to the lack of fire. Current forage conditions would remain unaltered in the short-term (10-15 years). In the longer term (over 15 years) there is potential for catastrophic wildfire, which could convert large areas to early seral conditions that would require an extensive period of time for full recovery. Alternative 1 would not be moving toward the LRMP's desired road density in deer summer and winter range and would continue to exceed LRMP standards and/or guidelines.

Direct and Indirect Effects – Big Game – Alternatives 2&3—Summer Range

Table 3.4.10 shows that Alternative 3 would reduce 22 total acres of hiding cover in IU 47 in non-black bark pine stands through commercial thinning and overstory tree removal, while Alternative 3 would not affect any acres in IU 50. Conversely, thinning within these stands and providing small gaps and openings would increase foraging/browsing opportunities of bitterbrush due to increased sunlight. By applying LRMP direction to leave a minimum of 10% in un-thinned clumps in each unit in black bark and non-black bark pine would retain hiding cover (see Figure 2.1 and Project Design Criteria). In addition, several clumps along roadways have already been identified on the ground and built into the project design for hiding cover. Either Alternatives 2 or 3 would be consistent with LRMP direction for hiding cover because hiding cover would remain well above desired conditions in IU 47 and there would be no change in IU 50.

Table 3.4.10 Effects to Hiding Cover by Alternative by Implementation Unit

Implementation Unit	Current hiding cover in non-black bark pine (%)	Alternative 2 post-treatment hiding cover (%)	Alternative 3 post-treatment hiding cover (%)	LRMP direction (%)
47 (30,922 acres)	56.6	56.4	56.4	30
50 (31,428 acres)	22.5	22.5	22.5	30

Table 3.4.10 shows Alternative 2 would affect more acres of forage/browse (particularly bitter brush) in summer range through prescribed burning versus Alternative 3. Although there is some reduction in browse through prescribed burning, burning would rejuvenate nutrient cycling in the soils and provide other foraging opportunities such as grasses and some forbs for deer and other wildlife species. Both Alternatives 2 and 3 would affect the same amount of acres of browse through mowing. It is estimated that the combination of mowing and prescribed burning could affect 50-70% of the shrubs. Bitterbrush regeneration varies by the type of treatment, the intensity of the treatment and the productivity of the site. In general, recovery to current canopy coverage/height levels would require a minimum of 10 years on good sites and likely over 25+ years on drier sites common to the project. As a mitigation measure, 20-30% of shrubs would be maintained in a mosaic of untreated patches during prescribed burning (both alternatives). In addition, project design for mowing would leave a mosaic of

treated and untreated shrubs to a minimum height of 8 inches, reducing impacts to browse and improving long-term forage conditions as shrubs regenerate and provide more nutritious browse. Overall, Alternative 2 would have more impact on bitterbrush than Alternative 3 due to more acres of prescribed burning.

Table 3.4.11 Effects to Forage & Browse by Alternative

Fuels Treatment Activity	Alternative 2 (acres)	Alternative 3 (acres)
Mowing	266	266
Prescribed burning	4,902	4,705

Direct and Indirect Effects – Big Game – Alternatives 2&3—Winter Range

Table 3.4.12 shows that both Alternatives 2 and 3 would slightly reduce hiding cover by 1% and meet LRMP direction, while thermal cover would be further reduced by 3% in the Tepee Draw WRHU and continue to be below LRMP direction. As previously stated, thermal cover is marginal due to previous harvests and currently most stands are about 80 years old. In addition, the existing forested stands that provide thermal cover lack structural diversity, contain tree-stocking levels above the historic range of variability, and most stands are experiencing bark beetle attacks (See Figure 3.2.1). Such stands would continue to increase in insect infestation and increased wildfire severity. LRMP M7-5 states the "tree canopy-cover conditions for optimum thermal protection may need to be compromised somewhat in order to moderate the risk of future catastrophic pine beetle damage. Cover should be managed at the highest percentage that would maintain healthy stand conditions with a low risk of catastrophic damage due to insects or disease."

As part of mitigation, units would be mowed prior to underburning to minimize scorch and impacts to thermal cover. Additionally, underburning would leave at least 40% crown cover on any dominant and codominant trees that are available. A December 1-March 31st timing restriction for treatment activities would be implemented to minimize disturbance.

Overall, there would be short-term impacts on thermal cover and thermal cover requirements would not be met under both Alternatives 2 and 3, but they would move towards desired conditions for thermal cover and HRV conditions in the long-term. The most applicable standard and guideline, given the current conditions would be M7-5. This standard and guideline allows thermal cover to be compromised and where treatment may be needed in order to moderate the risk of catastrophic damage due to insects and disease (LRMP 4-113, 4-114).

There is no LRMP standard or guideline that is applicable to elk (i.e. no designated Key Elk Area).

Table 3.4.12 Effects to Cover in the Tepee Draw Winter Range Habitat Unit

Type of Cover	Existing Cover (%)	Alternative 2 post-treatment (%)	Alternative 3 post-treatment (%)	LRMP Direction (%)
Hiding	14	13	13	10
Thermal	17	14	14	30

Alternatives 2 and 3 would affect approximately 1,099 gross acres of forage on winter range through prescribed burning and 11 acres through mowing. This affects the quantity of browse species such as bitterbrush and converts most to an early seral condition, providing quality browse in the short-term and

an increase in grasses and forbs since the current bitterbrush conditions are dominated by late seral (decadent) conditions. As part of project design and where applicable, shrub cover in MA 7 would be maintained in a mosaic of untreated patches within the 20-30%, 30-40%, and 40-50% range by using underburning (similar to the 1/3 strategy).The LRMP guidance for forage is to design treatment units to 300-500 acres including unmanipulated islands. If more than one unit is treated in a single year, treatment units should be 600 to 1,200 feet apart (M7-15). Burning prescriptions would provide for the reestablishment of bitterbrush within 20 years, while only 2.0-2.5% burned annually. Therefore, reentry for prescribed burning would be reviewed based on the current conditions (i.e. shrub recovery). Project design for mowing would leave a mosaic of treated and untreated shrubs to a minimum height of 8 inches. By applying these measures, it would be moving towards more optimum browse as recommended by the LRMP.

Direct & Indirect Effects – Big Game – Alternatives 2&3—Open Roads & Motorized Trails

Alternatives 2 and 3 would reopen 2.8 miles of temporary logging spurs and construct 10.7 miles of new temporary spur roads. This would have a short-term disturbance effect on habitat effectiveness for the duration of the project. Table 3.4.13 shows that Alternatives 2 and 3 would decrease the open road density in summer range in each IU due to decommissioning roads and proposed road closures. Given the locations of these roads (i.e. units 12, 23, 24, 39, 58 and 59), they should improve habitat effectiveness in summer range by providing larger blocks of core areas for security and solitude. No motorized trail closures are proposed in summer range under both alternatives.

Alternatives 2 and 3 would decrease the open road density in the Tepee Draw WRHU. Habitat effectiveness in this portion of winter range would slightly improve for deer. No motorized trail closures are proposed in the WRHU under both alternatives.

Table 3.4.13 Effects to Open Road Density

Area	LRMP Direction (miles/sq. mile)	Open Road Density (miles/sq. mile)	Post Alt 2 (miles/sq. mile)	Post Alt 3 (miles/sq. mile)
IU 47 (summer range)	2.5	2.68	2.67	2.67
IU 50 (summer range)	2.5	2.90	2.83	2.83
Tepee Draw (winter range)	1.0-2.5	4.27	4.19	4.19

The following LRMP standards and guidelines are applicable to the Flank EA: WL-53, TS-11 thru TS-14, and M7-22, pertaining to target road density of 2.5 p/sq mi in summer range and 1.5 p/sq mi in winter range. Alternatives 2 and 3 would not meet the target road density in summer range in IU 47 or 50, nor within the Tepee Draw WRHU, but would be moving toward the desired conditions in the respective IUs and WRHU. LRMP TS-13 states that if a preferred project alternative would exceed guidelines, a detailed further evaluation by a wildlife biologist would be required. This evaluation would include the biologist's professional judgment on the effects of the proposed project. If the evaluation concludes there is a net benefit, the project would be considered compatible with LRMP direction.

By applying the project design criteria and mitigation measures as described in the above sections, and considering seasonal road closures through the Green Dot System and Opine Travel Management Area, there would be a net benefit by slightly increasing habitat effectiveness in summer and winter range, a net benefit by increasing forage (grasses and forbs), and providing better quality browse through prescribed burning, and a net benefit of decreasing the risk of a catastrophic fire. In conclusion, the evaluation clearly shows that Alternatives 2 and 3 would be compatible with LRMP roads standards and guidelines.

Cumulative Effects – Big Game

IU 47 and 50 define the cumulative effects analysis in summer range, while the Tepee Draw WRHU defines winter range. The IUs were used as per LRMP direction to quantify road density and 30% of hiding cover in non-black bark pine in each IU. These are very large areas and well represent a deer's home range. The WRHU was used based on ODFW's recommendations. The past, present, and foreseeable actions listed in Section 3.1 were considered in this analysis for each IU.

The ongoing Opine EA project affects a small portion of winter range within the Flank EA, but affects the entire Tepee Draw WRHU. This project, in conjunction with Alternatives 2 and 3 of the Flank EA would reduce the amount of hiding and thermal cover and shrub cover within the WRHU. Conversely, Alternatives 2 and 3 of the Flank EA combined with the Opine EA decreases the amount of road density in the WRHU, thus increasing habitat effectiveness.

Past, current and future grazing would occur in the project area in the Cinder Cone grazing allotment. Livestock are primarily grazers, but at times may impact shrubs that are important to big game species when grasses are limited in the spring or fall due to the lack of rainfall. These effects are localized and would be considered insignificant because it does not occur each year. In addition, the range program assures that permittees stay within utilization standards of the permit.

The effects upon deer numbers cannot be quantified due to the number of variables that affect deer herds and their migratory nature, which extends their range outside of the project area. Cover is important for deer security particularly during hunting season. However, the proposed road density reductions, the existing Green Dot System and Opine Travel Management Area closure during hunting season compensate for cover reductions to a degree. In addition, ODFW may reevaluate the Opine Travel Management closure and make an amendment to the current timeframes from December 1st to November 1st to improve habitat effectiveness during the hunting seasons.

Overall, the reduction of risk to catastrophic wildfire would likely have less impacts to deer numbers than if wildfire eliminated large areas of cover and forage resources. In view of the direct and indirect effects, and by applying the mitigation measures and project design criteria, Alternatives 2 or 3 under the Flank EA would have slight cumulative impacts to deer in the short-term. This conclusion has been reached because Alternatives 2 or 3 would affect the percentages of thermal cover in the Tepee Draw WRHU. However, Alternatives 2 and 3 would improve habitat effectiveness by decreasing road density and would be moving towards LRMP standards and guidelines. The project would not contribute to an overall trend in species viability for big game at the forest level.

Management Indicator Species – Northern Goshawk

Analysis Methods – Northern Goshawk

The planning area was surveyed according to protocol by Woodbridge et al. (1993) in 2009. One goshawk nest site was discovered and located. As direct by the Eastside Screens, a 30-acre nest core was designated as well as a 400 acre post fledging areas. Reference the Flank Northern Goshawk Site Plan for additional information, and for maps and objectives for desired future conditions. The project area was visually assessed on the ground, and areas identified as primary goshawk nesting and foraging habitat were then surveyed. NatureServe Explorer (2009) reports from various sources of information that a goshawk territory would encompass 3 sq. miles or 1,920 acres of forest to 6,000 ac of forested stands in various seral stages. This would suggest that the planning area may contain habitat for 1-3 pairs of goshawks. A GIS analysis of goshawk habitat across the entire forest, estimates that there are currently 278,926 acres of habitat available.

Existing Condition – Northern Goshawk

One goshawk nest site was discovered and located. The planning area may contain habitat for 1-3 pairs of goshawks, based on an average territory ranging between 1,920 to 6,000 acres (NatureServe Explorer, 2009). A GIS analysis of goshawk habitat across the entire forest, estimates that there are currently 278,926 acres of habitat available.

In Oregon, goshawks tend to select mature or old growth stands of conifers for nesting. These stands typically have a high, multi-layered canopy with vegetation extending from a few meters above ground to more than 40 meters high. Generally, nesting sites are chosen that are near a water source and are on a moderate slope, and usually have a more northerly aspect. This habitat type is quite similar to that used by the Cooper's hawk, but the trees tend to be older and taller and have a better-developed understory of coniferous vegetation (Reynolds et al. 1992). The Forest LRMP describes goshawk nesting habitat as having mean canopy cover of >60%, at least 195 trees/acre, and a stand age of 100+ years. Foraging generally occurs within these mature stands with high tree densities, particularly of larger diameter trees (>16 inches), and high canopy closure (Beier and Drennan 1997), particularly where small openings occur (Marshall et al. 2006). They may prefer nesting in areas near trails which provide clear corridors (Squires and Reynolds 1997). Goshawks are opportunistic hunters, eating a variety of birds including passerines (e.g. songbirds), woodpeckers, game birds, and corvids (e.g. crows , ravens and jays), as well as squirrels, rabbits, and hares (Squires and Reynolds 1997). Some gallinaceous bird species are also preyed upon such as blue and ruffed grouse. Species and abundance of gallinaceous prey varies in the range of the goshawk depending on elevation and latitude. NatureServe lists the Northern Goshawk as vulnerable in Oregon.

Direct and Indirect Effects– Northern Goshawk –Alternative 1

Without treatments in the planning area, habitat, as it exists, would remain unchanged in the short-term. In the long-term stands that currently provide habitat would diminish due to beetles, mistletoe infestation, and from overstocking. Stands would initially continue to grow and some new habitat would develop, but due to insects, disease, and the potential for stand-replacement fire, the distribution of that habitat may diminish and suitable habitat would only exist in very small isolated pockets that may or may not support breeding pairs and fledglings.

Direct and Indirect Effects– Northern Goshawk –Alternative 2

The Flank Northern Goshawk Site plan includes 670 acres, with 81 acres designated as the core nest area, and 589 as the post-fledging area (PFA), both of which exceed the Forest Plan requirement of a 30 acre core nest area and 400 acre PFA. Under alternative 2, the core nest area would remain untreated. Although no management activities would take place within a quarter mile of the known nest site during the nesting season, and no management activities would occur within the core nest area during any season, some disturbance could take place. In the rest of the PFA, the prescription is similar to that for most of the ponderosa pine stocking prescriptions in the planning area. This prescription would result in open stands that would not be susceptible to bark beetle mortality for at least 20 years. This would be thinning from below leaving the largest dominant and codominant ponderosa pine trees at stocking levels of 40-50 square feet of basal area, while cutting all lodgepole pine in the stand. By focusing on the largest trees, a clumpy appearance to stocking can be expected. In the short-term, nesting habitat would be reduced as stands are thinned and tree canopies become more open. Somewhat mitigating these effects are the 10% wildlife leave areas within each stand which would not be treated, and foraging habitat would be increased. These retention areas would create some heterogeneity within the PFA, which is recommended by Youtz et al. 2007, but to a limited extent. It is consistent with the recommendations of Greenwald et al. 2005 in that the majority of the PFA would be managed to encourage the structural characteristics of mature and old growth forests, and consistent with the LRMP. In the long term, more suitable habitat would develop that would tend to be more stable, and less susceptible to stand replacement events. Management is for more mature forest structure which should benefit goshawks in the long-term, but could result in a short-term reduction in the heterogeneity needed by goshawks.

Direct and Indirect Effects– Northern Goshawk –Alternative 3

The Flank Northern Goshawk Site plan includes 670 acres, with 81 acres designated as the core nest area, and 589 as the PFA, both of which exceed the Forest Plan requirement of a 30 acre core nest area and 400 acre PFA. Alternative 3 proposes to manage this northern goshawk post fledgling area PFA in a manner similar to that described in Youtz et al. (2007). These recommendations are for the

Southwest, but studies in the inland Pacific Northwest, although more limited, appear to suggest similar habitat use and habitat relationships. DeStefano et al. 2006 and recommend "that the existing management guidelines for goshawks in the Southwest form a basis for management in the inland Pacific Northwest" based on research in eastern Oregon and Washington. Variability within and among stands, and a greater percentage of mature and old-forest structure, are the main objectives found in the recommendations. It is also consistent with the recommendations of Greenwald et al. 2005 in that the majority of the PFA would be managed to encourage the structural characteristics of mature and old growth forests. Each of the stand prescriptions would include a 10% retention area (untreated) in each stand, and two stands would remain untreated in their entirety. As a result, almost 30% of the PFA would receive no treatment. These prescriptions for treated areas intend to thin the stands to levels where bark beetle mortality would not develop as a common problem for more than 10 years, while still maintaining suitable goshawk habitat. See the end of section 2.2.3 and figures 2.7 and 2.8 for a description of treatments by stands within the Post Fledgling Area (PFA).

Although no management activities would take place within a quarter mile of the known nest site during the nesting season, and no management activities would occur within the core nest area during any season, some direct disturbance could occur, but would be minimal. Current habitat conditions would be maintained in approximately 30% of the PFA, and the remaining areas would be treated specifically to benefit goshawks. There would be no effects on existing or potential nest trees. In the very short-term, disturbance would have a negative impact, however, more suitable habitat would be created, and would be less susceptible to stand replacement events, and therefore benefit goshawk populations.

Cumulative Effects– Northern Goshawk

Cumulative effects for Northern Goshawk were analyzed for Forest Service land at the 6th field subwatershed level which includes Horse Ridge, Hunter and Tepee Draw subwatersheds. This is a commonly used scale because it reflects larger scale landscape issues as they impact wildlife, while remaining small enough to evaluate the impact on individual populations. The cumulative effects of the proposed treatments, together with foreseeable treatments within and adjacent to the planning area, is a short-term (<10years), downward trend in the overall amount of dense high risk stands currently used for nesting by the northern goshawk in this area. Disturbance of individuals during project implementation, as well as disturbance by recreationists and woodcutters could put additional stress on goshawks. However, forest health improvements would create an upward trend in the amount of open stand conditions more suitable as foraging habitat. Additionally, new nesting habitat would develop and be at lower risk to wildfire and beetle-induced mortality and of higher quality because of increased diameter growth due to thinning treatments within the planning areas. With current management objectives to develop more LOS habitat (often the best potential nesting habitat), treatments would assist in creating more stable habitat in the future. The results are likely more stable populations of these species throughout the landscape. At the subwatershed scale, the individual actions along with the proposed project actions would not have a significant effect on northern goshawk populations or habitat. The proposed project meets LRMP guidelines WL-3, WL-6 and WL-9 along with direction in the Eastside Screens Scenario A, (5) pages 12-13.

Management Indicator Species – Cooper's Hawk & Sharp-shinned Hawk

Existing Condition – Cooper's Hawk & Sharp-shinned Hawk

There are no known active sharp-shinned hawk nest sites associated with the proposed project area, however potential nesting and foraging habitat occurs throughout, particularly along the denser eastern edge of the proposed project area.

The Cooper's hawk prefers coniferous, mixed and deciduous forests, as well as riparian, juniper, and oak woodlands. The Forest LRMP describes Cooper's hawk nesting habitat as having mean canopy cover of >60%, at least 365 trees/acre, and a stand age of 50-80 years. Recent studies indicate that the vegetative profile around nests are trees 30-60 and 50-70 years old in northwest and eastern Oregon, respectively with tree density of 265/ac. and 469/ac. Coopers hawks commonly nest in

deformed trees infected with mistletoe (Marshall et al. 2006). There are no known active Coopers' hawk nests within the proposed project area, however potential nesting and foraging habitat occurs throughout, with the majority occurring in the eastern portion of the proposed project area.

In Oregon, the sharp-shinned hawk breeds in a variety of forest types that have a wide range of tree species, though most are dominated by conifers. Nests have been located at elevations that range from roughly 300 to 6000 feet. Vegetative characteristics found at nest sites, include high tree density and high canopy cover, which produce cool, shady conditions. Nest stands preferred by sharp-shinned hawks are younger than those preferred by Coopers' and goshawk, usually 25-50 yr old, even-aged stands (Marshall et al. 2006). The Forest LRMP describes sharp-shinned hawk nesting habitat as having mean canopy cover of >65%, at least 475 trees/acre, and a stand age of 40-60 years. Bildstein and Meyer (2000) suggest home range sizes of approximately 990- 4,500 acres for Cooper's hawks and 1,990-2,730 acres for sharp-shinned hawks. Based on these range sizes, there is potential habitat for 1-5 Cooper's hawks and 2-3 sharp-shinned hawks within the proposed project area. Both of these species are listed as apparently secure in Oregon by NatureServe.

Direct and Indirect Effects– Cooper's Hawk and Sharp-shinned Hawk –Alternative 1

Currently the majority of the potential habitat for these species is within the early-mid seral stands of ponderosa pine, which tend to be overstocked and are at risk of beetle infestation as well as stand replacing fire. Without treatment, in the short-term these stands would continue to provide habitat, however in the long-term they would begin to deteriorate and new habitat development would decrease. Stands would become more prone to wildfire and beetle infestation, and habitat potential may ultimately decline.

Direct and Indirect Effects– Cooper's Hawk and Sharp-shinned Hawk –Alternative 2

In the short-term, habitat would be reduced as stands are thinned and tree canopies become more open. In the long term, more suitable habitat would develop that would tend to be more stable, but the total amount of habitat would remain reduced. More open forest conditions would be more stable, but for species such as these, which select for dense stands with high canopy closure, there would be a long-term reduction of habitat. Somewhat mitigating these effects are the 10% wildlife leave areas within each stand which would not be treated. A heterogeneous landscape would retain habitat for species requiring dense forest conditions while also reducing the risk of stand-replacement events and providing habitat for other species which are associated with more open conditions. Disturbance by project implementation would also have short-term negative effects. PDCs requiring active nests to be reported and limiting treatments that to occur within a quarter mile of nest sites during the nesting season would help to reduce this disturbance. There are currently no known nest sites, but should any be identified prior to or during project implementation, theses restrictions would apply.

Direct and Indirect Effects– Cooper's Hawk and Sharp-shinned Hawk –Alternative 3

The effects of alternative 3 would be similar to those of alternative 2; however, greater diversity in treatments and the reduced area treated would be less detrimental to Cooper's hawk and sharp-shinned hawks habitats in the short-term. Conversely, a larger area would remain more vulnerable to insects and disease, although these areas would be buffered by surrounding areas, which would be managed for more open and resilient stand conditions.

Cumulative Effects– Cooper's Hawk and Sharp-shinned Hawk

Cumulative effects for these two accipiters were analyzed for Forest Service land at the 6th field subwatershed level which includes Horse Ridge, Hunter and Tepee Draw subwatersheds. This is a commonly used scale because it reflects larger scale landscape issues as they impact wildlife, while remaining small enough to evaluate the impact on individual populations. Cumulative effects were analyzed for the actions listed in table 3.1. Cooper's hawks and sharp-shinned hawks have likely benefitted from fire suppression and forest management practiced which have increased the amount of early and mid-seral forest conditions. Forest management which aims to return large areas of the forest

to within the Historical Range of Variability (HRV), may therefore reduce the amount of available habitat. Conversely, while treatments reduce total nesting habitat, they also result in more resilient forests. By applying a patchy implementation which leaves areas of denser, younger stands within a matrix of more open, resilient forests, we are likely to see more stable population trends in the future. Habitat alteration would occur on less than 10% of the cumulative effects bounding area, which would have a negligible effect on these species. Based on this, the project would not affect species viability at the Forest level for these two species. All alternatives meet LRMP guidelines.

Management Indicator Species – Red-tailed Hawk

Existing Condition – Red-tailed Hawk

Red-tails are commonly observed soaring in the planning area and are common across the district, but there are no known nest sites that occur within the planning area. The planning area provides some foraging habitat, primarily in lower elevation forest openings.

This species has an extremely wide tolerance for habitat variation. Red-tails are largely perch hunters, and habitat types that provide suitable perches (trees, utility poles, outcrops, etc.) and that are open enough to permit the detection of ground-dwelling prey, typically support red-tailed hawks. Red-tails frequent woodland, agricultural land, clearcuts, grasslands, sagebrush plains, alpine environments, and urban areas. They construct nests in a variety of situations including tree, utility poles cliffs, and place their nests higher than other broad-winged hawks (Marshall et al. 2006). Potential roost and nest sites are scattered throughout the area as well, although these larger diameter trees are rare in much of the proposed project area. NatureServe (2009) ranks this species as “secure” in most of continental United States, including Oregon.

Direct and Indirect Effects– Red-tailed Hawk –Alternative 1

In the short-term there would be no change in red-tailed hawk habitat. In the long-term stands would be slow to mature due to over stocking, and nest trees would be incidental due to the lack of LOS that would develop. Suitable nest trees may become more sporadic on the landscape.

Direct and Indirect Effects– Red-tailed Hawk –Alternative 2

Under alternative 2 the project would not affect or remove any nesting habitat (i.e. trees >21”dbh). The thinning and fuels treatment would open stands, creating better foraging habitat as well as promote a better forage base for prey species. Thinning, in the long-term, would accelerate the development of more large trees used for nesting. Additionally, treatments are designed to reduce the risk of crown replacement fire. These types of fires would reduce nesting habitat in the long-term, but would create openings that would function as foraging habitat. Disturbance by project implementation would also have short-term negative effects. PDCs requiring active nests to be reported, and prevent treatments from occurring within a quarter mile of nest sites during the nesting season would help to reduce this disturbance.

Direct and Indirect Effects– Red-tailed Hawk –Alternative 3

The effects of alternative 3 would be very similar to those of alternative 2. This alternative includes leaving more stands at higher densities, and creating a few small openings in one stand. Because more area is left at a higher density, tree growth in those stands would be slower, and therefore nesting habitat would be slower to develop. Also due to the higher density, more of the proposed project area would be vulnerable to stand-replacement fires, which could in the future provide more foraging habitat.

Cumulative Effects– Red-tailed Hawk

Cumulative effects for red-tailed hawks were analyzed for Forest Service land at the 6th field subwatershed level which includes Horse Ridge, Hunter and Tepee Draw subwatersheds. This is a commonly used scale because it reflects larger scale landscape issues as they impact wildlife, while remaining small enough to evaluate the impact on individual populations. The cumulative effects of

past, present and reasonably foreseeable actions (see table 3.1) include increased disturbance of individuals, retention and development of nesting habitat, and the creation of better foraging habitat. The proposed actions under each action alternative would not result in cumulative negative effects on red-tailed hawks or their habitats, and all relevant LRMP standards and guidelines and Eastside Screens are being met.

3.4.10 Species of Concern, Birds of Conservation Concern & Land birds

Introduction – Species of Concern, Birds of Conservation Concern & Land birds

Each species would be discussed below under the appropriate habitat. Birds of Conservation Concern 2008 (BCC) identified migratory and non-migratory bird species that are not federally designated as threatened or endangered, but are highly in need of conservation action. Within or adjacent to the project, the following species are on this list: loggerhead shrike, pinyon jay, green-tailed towhee, and calliope hummingbird. Pygmy nuthatches are also on the BCC list, and, in addition, are listed by Altman 2000 as focal species for priority habitats, which occur within the project area. Chipping sparrows, lazuli buntings, gray flycatchers, and olive-sided flycatchers are also on Altman's list of landbird focal species (hereafter referred to as landbirds) for focal habitats within the project area. USFWS 2010 identifies species in Deschutes County, which are considered Species of Concern. These include the mountain quail, Preble's shrew, and northern sagebrush lizard. Bats considered Species of Concern are discussed in the section on bats (3.4.11).

Table 3.4.14 Relationship of BCC & Landbird Species to Key Features by Habitat Type*

Habitat Type	Habitat Feature/Conservation Focus	BCC & Landbird Focal Species
Ponderosa Pine	large patches of old forest with large snags	white-headed woodpecker
	large trees	pygmy nuthatch
	open under-story with regeneration pines	chipping sparrow
	patches of old burned forest	Lewis' woodpecker
	old-growth with interspersed grassy patches	flammulated owl
	old-growth with open canopy	Wouldiamson's sapsucker
	edges and openings	olive-sided flycatcher
	ponderosa woodlands and edges	pinyon jay
Lodgepole Pine	old growth	black-backed woodpecker
Sagebrush/Shrub Lands/Open Woodlands	sagebrush cover	Brewer's sparrow
	sagebrush and pine woodlands	northern sagebrush lizard
	sagebrush-dominated openings within coniferous forests	Preble's shrew
	Brushy mountainsides, coniferous forest, forest and meadow edges, sagebrush, pinyon and juniper	mountain quail

	shrub stands, grasslands, and forest openings	green-tailed towhee
	open habitat with scattered trees	Loggerhead shrike
	ecotone edges	Lark sparrow

***From Altman 2000 and Altman and Holmes 2000**

Existing Condition – Ponderosa Pine

White-headed woodpeckers, pygmy nuthatches, flammulated owls, pinyon jays, and Wouldiamson's sapsuckers are associated with large structure, open forests. In the breeding season, Lewis' woodpeckers are associated with stand replacement fires with large snags, and relatively low-density pre-fire conditions. Chipping sparrows are associated with an open understory with pine regeneration, in the east cascades their abundances do not appear significantly different between thinned and unthinned stands. Olive-sided flycatchers are associated with edges within ponderosa pine habitats, particularly those created by wildfire.

Ponderosa pine forests have incurred one of the most widespread and strongest declines among habitat types in analysis of source habitats for terrestrial vertebrates in the Interior Columbia Basin (Wisdom et al. in press). In particular, old-structure single over-story ponderosa pine habitat has declined measurably (Wisdom et al. in press). The result of degradation of ponderosa pine forest from fire suppression and extensive timber harvest has been the change of large areas of late-seral ponderosa pine forest to mid-seral. According to Altman (2000), due to the extensive loss of ponderosa pine forest, habitat restoration is the most important strategy for conservation of landbirds associated with this habitat type. The desired condition in ponderosa pine forest is a large tree, single layered canopy with an open, park-like under-story dominated by herbaceous cover with scattered shrub cover and pine regeneration. Ponderosa pine forest within the East-Slope Cascades Landbird Conservation planning unit occurs extensively at low elevations in all the subprovinces except Columbia Foothills where it is a minor component.

Conservation strategies described by Altman 2000 for management of ponderosa pine habitats include: use of prescribed burning and/or thinning when and where appropriate to reduce fuel loads and accelerate development of late-seral conditions; retain all large trees, especially ponderosa pine >20" dbh; initiate snag creation and recruitment where necessary; retain all existing snags and broken-topped trees in units; implement road closures (obliteration); and minimize invasion of exotic and noxious weeds and soil erosion.

Existing Condition – Lodgepole Pine

A very limited amount of lodgepole pine (approximately acres or 3% of the proposed project area) is found within the proposed project area, and where lodgepole pines do occur, it is typically in conjunction with an overstory of ponderosa pine. Conservation strategies include leaving portions unsalvaged in burned and beetle-killed areas and retaining old-growth trees and areas with LOS where possible. There is no LOS within the proposed project area.

Existing Condition –Sagebrush/Shrub Lands/Open Woodlands

A number of species on the BBC 2008 list are associated with forest openings, shrub stands, and meadows. In the project area, there are no large expanses of sagebrush, but there are some small shrub stands within the forested matrix that contain a sagebrush component. Within the project area, these openings occur primarily at the lower elevations along the eastern edge of the project area. The dominant species in these openings are sagebrush *(Artemisia tridentata)* and bitterbrush *(Purshia tridentata).* Species that require large expanses of these shrublands are unlikely to be present, but species that typically use edges or woodlands such as green-tailed towhees and gray flycatchers, or species that are sometimes found in smaller habitat patches, such as Brewer's sparrows, may be present.

Direct and Indirect Effects– SOC, BCC, and Landbirds –Alternatives 1

Ponderosa pine

In ponderosa pine stands, under the no action alternative, stands would continue to mature, but due to the current high densities would remain at increasing risk of a landscape scale stand replacing fire or high levels of bark beetle attacks or both. Tree growth in most of the proposed project area would remain slow, and LOS would be slow to develop. Ladder fuels would continue to build and risk of crown fires in the stands would increase. Future habitat would either be lost or be unlikely to develop for species associated with mature structure, open conditions, or old-growth. These species include white-headed woodpeckers, pygmy nuthatches, flammulated owls, pinyon jays, and Wouldiamson's sapsuckers. Chipping sparrow and olive-sided flycatchers should be relatively unaffected by this no action alternative. Landbird conservation in ponderosa pine forest emphasizes maintaining healthy ecosystems through representative focal species for four habitat conditions. These include large patches of old forest with large snags, large trees, and an open under-story with regenerating pines, and patches of burned old forest, and alternative 1 does not adhere to these recommendations.

Lodgepole Pine

The focal species for lodgepole pine habitats is black-backed woodpeckers, however, the amount of lodgepole pine habitat within the proposed project area is limited. Landbird recommendations include leaving portions unsalvaged in burned and beetle-killed areas and retaining old-growth trees and areas with LOS where possible. Alternative 1 would include leaving all portions unsalvaged and untreated, providing habitat for black-backed woodpeckers.

Sagebrush/Shrub Lands/Open Woodlands

Forest openings, shrublands, and meadows would be unaltered in the short-term under alternative 1. In the long-term, pine seedlings would continue to develop, and some of these areas may convert to forest, reducing habitat for green-tailed towhees, Brewer's sparrows, northern sagebrush lizards, Preble's shrews, mountain quails, loggerhead shrikes, and lark sparrows. Alternatively, large stand-replacement events could result in even larger areas of openings, or move these shrub stands to an earlier seral stage with grasses as a potential dominant. Smaller, lower intensity fires could result in a mix of seral stages, with both grasses and shrubs as co-dominants. Under alternative 1, if stand replacement fire does not modify the habitat structure, habitat for these species would be reduced, however, if stand replacement fire occurs, these same species would have reduced habitat in the short-term since shrub cover would initially reduced, but would likely benefit once the shrub layer has had time to recover.

Direct and Indirect Effects– SOC, BCC, and Land Birds –Alternatives 2 and 3

Ponderosa Pine

Under alternatives 2 and 3, much of the project area would be managed toward these LOS conditions, thereby benefitting white-headed woodpeckers, pygmy nuthatches, flammulated owls, pinyon jays, and Wouldiamson's sapsuckers. These species are of special concern due to the decline in this type of habitat, making the positive effects of these action alternatives especially important.

The chipping sparrow, another focal species of ponderosa pine, is associated with an open understory with regenerating pines. Its abundance has not been found to be different between thinned and unthinned sites. The main effect of treatments on chipping sparrows is therefore likely to be from short-term disturbance during management activities, and the alteration of habitat by prescribed burns, both of which should have a minimal effect. Olive-sided flycatchers are likely to benefit from low-intensity prescribed fire (Kennedy and Fontaine 2009) and are often associated with the more open forest conditions that both of these alternatives would create.

Lodgepole pine

Black-backed woodpeckers are the focal species for lodgepole pine habitats, and are strongly associated with stand replacement events created by fire, insects, or disease. Olive-sided flycatchers, three-toed woodpeckers, and northern flickers, although not lodgepole pine focal species, are also likely to benefit from stand replacement fires in lodgepole pine habitats. Under alternatives 2 and 3, the majority of the project area would be treated to reduce the likelihood of the stand-replacement events that these species favor. As a result, this type of habitat is less likely to develop in the future. However, the prescriptions include leaving a mosaic of untreated patches throughout the project area. These patches would be more vulnerable to stand-replacement fires, and could provide a distribution of habitat through space and time. The creation of smaller patches through retention areas would be more spatially and temporally stable.

Under both alternatives 2 and 3, thinning treatments are intended to increase the resiliency of remaining trees to insects and disease, areas with a mix of ponderosa and lodgepole pine would be managed towards ponderosa pine. Under alternative 2, the salvage logging would occur on approximately 770 acres of beetle-killed pine, primarily of lodgepole pines within ponderosa pine plant associations. Both alternatives would reduce habitat for black-backed woodpeckers, with the largest reduction occurring under alternative 2. Alternative 3 leaves a larger area untreated, and would not include the removal of snags.

Sagebrush/Shrub Lands/Open Woodlands

The habitats for green-tailed towhees, Brewer's sparrows, northern sagebrush lizards, Preble's shrews, mountain quails, loggerhead shrikes, and lark sparrows are more likely to be affected by prescribed fire than the thinning treatments, although both management actions could have an effect on nesting birds. All of these avian species nest in shrubs or near the ground, at least occasionally. In all of these habitats, logging and fuels treatment activities in the spring and summer may disturb local nesting populations of neotropical migratory birds (NTMBs) and destroy some nests, but are not expected to compromise population viability. Mitigation measures direct the maintenance a minimum of 20-30% of the shrubs in a mosaic of untreated patches in MA8 (General Forest), and a minimum of 40-50% in MA7 (Deer Habitat). The majority of the forest openings and shrub stands occur within MA7.

Prescribed burns can be unpredictable, but with these mitigations in place, portions of these openings should be retained untreated, while portions would be moved to a different seral stage. Treatments would reduce shrub cover in the short-term, but would also create openings so that future shrub habitat to develop. This would help ensure a stable mosaic of seral stages through space and time. Both alternatives 2 and 3 would

Alternative 3 would maintain the most suitable habitat distribution for shrub and grassland species due to greater variability in prescriptions and the closure of several roads, while still enhancing stands to provide sustainable LOS in the long-term. Stand-replacement fires, however, are likely to create these types of habitats, and both alternative 2 and 3 are intended to reduce the risk of large-scale stand-replacement fires. However, the remaining patches of high density forest would remain vulnerable to small-scale stand-replacement fires which would create a greater amount of edge habitat.

Cumulative Effects– SOC, BCC, and Landbirds

Cumulative effects for SOC, BCC, and Landbird species were analyzed for Forest Service land at the 6th field subwatershed level which includes Horse Ridge, Hunter and Tepee Draw subwatersheds. This is a commonly used scale because it reflects larger scale landscape issues as they impact wildlife, while remaining small enough to evaluate the impact on individual populations. Cumulative effects were analyzed for the actions listed in table 3.1. Forest Plan Standards and Guidelines for SOC, BCC, and Landbirds would be met with any alternative in this project.

Ponderosa pine

Past, current, and future projects which are impacting this habitat type within the project area and surrounding subwatersheds include thinning, reforestation, firewood cutting, grazing, and OHV trail use.

In general, the restoration and thinning treatments are designed to retain and grow larger diameter trees. The removal of snags through salvage logging and firewood cutting are cumulative effects, and when combined with salvage logging occurring under alternative 2 is resulting in an increasing shortage of snags. While lodgepole pine snags would be removed under alternative 2, no ponderosa snags would be removed under any of the alternatives. Use of the area during treatments, and by recreationists using OHV trails is also likely to have a negative cumulative effect on species. Positive cumulative effects, however, include moving more of this area towards HRV and the conditions recommended by Altman (2000), which would benefit the species most negatively impacted by past actions. The cumulative effects in ponderosa pine would therefore be positive for these species, provided that measures to create and protect snags are met

Lodgepole pine

Only 3% of the proposed project area is within lodgepole pine plant associations, however, within the surrounding subwatersheds, lodgepole pine habitats have been affected by salvage logging, firewood collection, livestock grazing, and large fires including the 1988 Paulina fire which burned over 12,000 acres, approximately 2/3 of which was within these subwatersheds. The cumulative effects of these actions and wildfires are that there is very little lodgepole pine in LOS conditions and snag levels are low within these subwatersheds. The relatively small amount of lodgepole pine to be treated within the proposed project areas would reduce its contribution to the cumulative effects of all past, present, and future actions. The effects of alternatives 2 and 3 would be insignificant at the subwatershed level, since there are over 18,000 acres of lodgepole pine plant associations, but only 190 acres of this are within the proposed project area. The cumulative effects to the lodgepole pine focal species, black-backed woodpeckers, would be negligible under all 3 alternatives.

Sagebrush/Shrub Lands/Open Woodlands

Many of the current and future projects are for forest restoration, and rarely include creating openings. Where wildfires and sometimes prescribed burns create or maintain openings, salvage logging and replanting often prevent shrublands from developing. Approximately 35% of the Opine project area is within the same subwatersheds as the Flank project. The Opine project implementation includes some treatments, such as prescribed burn, which would move more of these openings towards early seral conditions; a little over 20,000 acres of Opine would be treated over the course of the next 10 years, and a small portion of this (approximately 2,700 acres) is within the same subwatersheds as Flank. The majority of Opine is within deer winter range (MA7), which limits the amount of area that can be treated on an annual basis. Forest-wide, only 2-2.5% of MA7 may be treated with prescribed fire each year. The result of this is that cumulatively more forest openings may be created or retained as a result of treatment, but across the larger landscape the number would remain small. An additional effect on these systems is grazing, with livestock often favoring these open areas which may contain higher amounts of browse and forage compared with dense forest conditions. This project would help create more of a mosaic and greater system stability. The cumulative effects of these projects on these habitat types would be insignificant.

3.4.11 Bats

Townsend's big-eared bats, small-footed myotis bats, long-eared myotis bats, and long-legged myotis, are all on the USFWS list of species of concern for Deschutes County. Townsend's big-eared bats are also on the Regional Forester's Sensitive Species list, and are listed as imperiled in Oregon on NatureServe.

Existing Condition– Bats

The Townsend's big-eared bat has been documented on the Deschutes National Forest. This species of bat depends on caves for hibernation, for raising their young, and for day and night roosting. They forage in a broad range of forest conditions, from open savanna to fully stocked conifer stands, and prey species are strongly associated with bitterbrush, Ceanothus, and other shrub species (Miller

1995). Lava flows and lava tube caves occur in the surrounding area, but there is no known roosting habitat within the project area. Since these bats can forage upwards of 5 miles from roosting sites (Gruver and Keinath 2006), and potential roosting sites are within a few miles, there is potential for foraging to occur within the proposed project area. Townsend's big-eared bats are especially sensitive to human disturbance of roosting sites, but there are no known roosting sites within the project area. This bat typically forages in the canopies and along the edges of mature stands. They do not typically use larger clear-cuts or early seral regenerating stands (Gruver and Keinath 2006). Townsend's big-eared bats are extremely likely to use portions of the project area for foraging.

Small-footed myotis roosting, nursing, and hibernating habitat occurs on the Deschutes National Forest. While primarily associated with cliffs and rock canyons in arid grassland and desert scrub, this species is also found in ponderosa pine and mixed conifer forest. It finds night roost and day retreats in rock crevices, under boulders or, sometimes, beneath bark, and hibernates in caves and mines. This species forages over rocks rather than water. It flies along cliffs and rocky slopes at heights of 1 to 3 meters (Csuti et al. 2001). Potential small-footed myotis habitat occurs throughout the project area.

Long-eared myotis has been documented on the Deschutes NF. This species is associated primarily with forested habitats and forested edges, including juniper woodland, open areas in ponderosa pine woodlands, Douglas-fir, spruce, true fir, and subalpine forests, as well as wouldow and alder forests along streams. It also occurs in arid shrublands if suitable roosting sites are available. The long-eared emerges late in the evening, and feeds by picking prey items off the surface foliage. Although most probably migrate out of state during the coldest part of the year, a few have been found in caves in Oregon during winter (Csuti et al. 2001). Potential long-eared myotis habitat occurs throughout the project area.

The long-legged myotis has been documented as occurring on the Deschutes NF, and is most closely associated with forested habitat, most notably old growth stands. Day and night roost habitat mainly consists of large diameter snags and rock crevices (Ormsbee 1995). Perlmeter 1998 and 1999 data showed that this species on the Bend Ft. Rock selected large ponderosa pine snags >21 inches dbh for day roosts. Foraging occurs in mature open stands and early seral stage stands (Erickson and West 1995). Trees and large snags provide the most important habitat for nursery colonies (Barbour and Davis 1969). These bats have been documented to hibernate in caves on the Deschutes NF. Potential long-legged myotis habitat occurs throughout the project area, but the mature open stands and early seral stage stands they are associated with are very limited.

Direct and Indirect Effects– Bats –Alternative 1

Habitat conditions would remain unchanged as a result of the no action alternative in the short-term, so that there would be no short-term effects on any of these bat species. In the long-term, tree growth would remain slow, and stands would remain dense, growing increasingly susceptible to stand-replacement disturbances such as fire. Townsend's big-eared bats are associated with mature stands, long-eared myotis are associated with open areas in ponderosa pine, and long-legged myotis are associated with old growth. Mature or old-growth stands would be slow to develop under this alternative, and therefore habitat for these species would remain limited. Without a stand-replacement event, shrub cover is also likely to decrease, thereby reducing the amount of foraging habitat available to Townsend's big-eared bats. If a stand-replacement event does occur, however, it would likely create foraging habitat for this bat. Small-footed myotis are primarily associated with arid grasslands and desert scrub, but are also found within ponderosa pine forests. The long-term effects of alternative 1 on this bat are unclear.

Direct and Indirect Effects– Bats –Alternatives 2 and 3

Most of these bat species are associated, at least partially, with mature ponderosa pine forests, and utilize large snags as day roosts. These alternatives do not propose the removal of any large trees that are > 21" dbh. No large snags that are potential roost sites would be removed unless there is a safety issue with the tree (i.e. hazard tree adjacent to campground or roadside). The primary objectives for treatments are to restore the historic range of variability of ponderosa pine moving much of it towards LOS conditions. Treatments would be beneficial to Townsend's big-eared bats, long-eared myotis, and

long-legged myotis in the long-term by promoting the LOS habitat that these species are associated with. The effects of these alternatives on small-footed myotis on unclear, but due to its habitat use of primarily arid grasslands and desert scrub, neither of which are present within the proposed project area, are likely to be minimal. The vegetation that provides habitat for preyspecies such as moths would be reduced by burning and mowing, and individuals may be disturbed during treatment operations, but these would both be short-term impacts.

Cumulative Effects– Bats

Cumulative effects for bats species were analyzed for Forest Service land at the 6th field subwatershed level which includes Horse Ridge, Hunter and Tepee Draw subwatersheds. This is a commonly used scale because it reflects larger scale landscape issues as they impact wildlife, while remaining small enough to evaluate the impact on individual populations. Cumulative effects were analyzed for the actions listed in table 3.1.

Cumulative effects would primarily result from similar treatments in the Opine Project Area. There would be cumulative short-term impacts to foraging/prey habitat as a result of prescribed fuels and mowing treatments. The cumulative effects of these treatments may be a decrease in the prey availability for bat species that forage over shrubs, but improved roosting structure in the planning area. Based on earlier habitat descriptions, it appears that most of the bat species discussed forage or hunt within a variety of habitats ranging from rocky areas to tree foliage, and many prefer the more open stands that treatments are managing towards. Therefore, most of these bat species are likely to benefit from these treatments. Forest direction relevant to bats is primarily directed towards protecting Townsend's big-eared bats (WL-64-71) by protecting hibernacula, monitoring caves, conducting surveys at caves, and planning and designing water structures to allow for use by these bats. There are no caves within the proposed project area, and water structures are not being created. Although there is Townsend's big-eared bat habitat within the project, the proposed project would not result in a loss of habitat. Based on this, the project would not contribute to a downward trend of species viability at the Forest level. Forest direction pertaining to snags is also relevant for many bat species, and snags can provide roost sites. As discussed under the section on snags, snag levels are currently low within the proposed project area. However, all ponderosa pine snags and large diameter lodgepole pine snags would be retained, and it is these large diameter snags that are particularly valuable as roost sites. A long-term concern, however, is that these large diameter snags are low across the landscape due to past management actions, and levels would remain low under all three alternatives.

3.5 Soils

3.6.1 Introduction

The Flank project area is located on the northeastern flanks of the volcanic Paulina Mountain complex. The landforms, rocks, and soil that comprise the project area are primarily products of volcanism and historic water movement off the slopes of the Newberry Complex. Elevation ranges from about 4,950 feet along China Hat Rd (Forest Rd 18) to 5,500 feet near the base of Company Butte. Mean annual precipitation ranges from 14 to 20 inches.

The project area includes a number of finger ridges comprised of volcanic basalt flows that have been dissected by water flow during a previously wetter environment. The finger ridges fan out into gentle toe slopes at the northern extent of these flows. Side slopes of the volcanic fingers range from 0 to 20 percent, with short pitches exceeding 30 percent. The spines and toeslopes of the volcanic fingers, as well as the draw bottoms, have gentle slopes ranging from 2 to 10 percent.

Soil mapping within the project area consists of 4th order landtype units contained in the Deschutes National Forest Soil Resource Inventory (SRI). Descriptions of the SRI landtype units are based on similarities in soil, landforms, geology, and climatic conditions that influence defined patterns of soil and vegetation (Larsen, 1976). Field observations confirm that the dominant surface soils in the project area developed from volcanic pumiceous ash deposits ejected from Mt. Mazama approximately 7,600 years ago and vary in depth from 10 to 25 inches. Surface and subsurface textures of these ash-influenced soils are primarily sandy loams and loamy sands. Mineral soil consists mainly of sand-sized

soil particles with little or no structural development due to the relatively young geologic age of the volcanic parent materials. Soils are non-cohesive (loose) and have naturally low bulk densities with a relatively low to moderate susceptibility to compaction.

Soils within the project area have high infiltration and percolation rates that readily drain excess moisture from storm events or snowmelt. Subsurface bedrock materials and underlying residual soils comprised of older ash have a moderate capacity to store water but are not likely to be impermeable at depth. Lands within the project area yield no surface water contained in streams or lakes.

3.6.2 Regulatory Framework

- 36 C.F.R. 219.14(a) classifies lands that are not suited for timber production as Non-forest; No lands within the Flank project area are identified as unsuitable in the Forest GIS Suitability layer.
- Forest Service Manual 2520 R-6 Supplement No.2500-98-1—provides soil quality standards and guidelines to limit detrimental soil disturbances. Conditions for detrimental compaction, puddling, displacement and severe burn damage are defined for the soul resource in that document.
- Deschutes Land and Resource Management Plan Standards and Guidelines SL-1, SL-3, SL-4 and SL-5 direct activities in a way that would promote and maintain the enhancement of soil productivity.

3.6.3 Analysis Methods

Interpretation of 1943 aerial photographs and data gathered from the Forest Activity Tracking System (FACTS) database were initially used to stratify the extent of existing soil disturbance within the proposed activity units. The extent of the 1930s era skid trails and logging facilities from railroad logging was interpreted off the 1943 photos for each proposed activity unit (Table 3.6.3). Management activities dating back to the 1960s within the planning area for all units entered during this period were pulled from the FACTS database. Representative Flank unit areas were then identified for field monitoring that expressed a cross section of past activities, including four units with machine harvest prescriptions during the 1980s and previous railroad logging, and one unit with only past railroad harvesting (Table 3.6.1). These units were quantitatively monitored in the field using visual assessments and shovel probes to record surface soil disturbance and compaction levels at 5 foot intervals along transects. This information was then extrapolated to estimate the existing condition of proposed Flank units with similar past prescriptions.

Analysis of the type and extent of soil disturbance to be incurred by activities proposed under this document is based on past monitoring of machine harvest activities similar to those that would be utilized for the Flank project. The potential extent of detrimental soil disturbance associated with this project proposal accounts for the inherent susceptibility of the soil types present to compaction and displacement, along with the physical characteristics of the logging systems, including the cruised volume removed per acre, the type of logging equipment likely to be used, the spacing of skid trails, and the extent (surface area) of temporary roads, log landings, and designated skid-trails used to facilitate yarding activities within each of the commercial thinning activity areas. Analysis of the potential effects of this disturbance includes professional judgment, research references and field surveys of past harvest activities.

Table 3.6.1 Monitoring of Past Harvest Activities Within the Flank Planning Area

Previous Project and Harvest Unit	Flank Unit Number	Year of Harvest	Previous Harvest Prescription	Acres	Measured Detrimental Soil Conditions (%)
Orphan #5	75	1971	Clear Cut	12	15
Little Orphan #5	56	1985	Black Bark Thinning	83	15
Taghum Butte #12	21	1990	Black Bark Thinning	45	16
Humbug #19	23	1991	Black Bark Thinning	83	19
Tepee #1	67	1988	Overstory removal	70	25
Railroad Logging	27	1930s	Clear cut	87	7

3.6.4 Desired Future Condition

The primary management goal for the soil resource is to maintain or enhance soil conditions at acceptable levels without impairment of the productivity of the land. A desirable landscape effectively absorbs and distributes water, and erosion rates occur within natural ranges of variability. The extent of detrimental soil disturbances should be minimized through the application of management requirements and mitigation measures designed to minimize, avoid or eliminate measurable impacts in order to reduce the need for restoration techniques to rectify impacts in site-specific areas. The biological productivity of soils is ensured by management prescriptions that retain adequate supplies of surface organic matter and coarse woody debris without compromising fuel management objectives or the risk of soil damage from surface wildfire. The total area of cumulative detrimental soil conditions should not exceed 20% of the total acreage within the activity area, including roads and landings.

3.6.5 Existing Condition

The existing condition of the soil resource is influenced by natural events or managed activities capable of altering the physical, chemical or biological characteristics of the mineral soil. Past mechanized management activities are the primary source of existing impacts to the ash influenced soils within the project area, which are moderately susceptible to compaction and displacement from mechanized activities. The predominantly sandy-loam textured soils within the project area are not susceptible to soil puddling damage due to their lack of plasticity and cohesion. Compaction and displacement due to past mechanical activities are present to varying degrees and extent across the project area.

Compaction of ash soils occurs when machine traffic exerts vibrational and compressional forces on the surface. Multiple passes of harvest, yarding and piling machinery can increase the soil strength and reduce the porosity of sandy loam soils to levels that effect productivity. Skid trails and landings are typically detrimentally compacted following harvest and yarding operations. Compaction from railroad era activities was observed in the field to have been ameliorated substantially during the 70 plus years since these activities occurred. Compaction from mechanized harvests that occurred during the 1970s, 80s and 90s remains evident in the soil profiles.

Soil strength in local soils can be reduced by subsoiling, which loosens compacted soil layers and improves the soils ability to supply nutrients, moisture, and air that support vegetative growth and biotic habitat for soil organisms.

Susceptibility to displacement is moderate to high for the coarse textured surface layers present in the project area. Soil can be easily displaced by equipment operations, especially when machinery maneuvers on slopes during dry moisture conditions. However, the extent of displacement is generally localized and rarely in excess of acceptable LRMP and R6 standards. Areas of displacement large enough to exceed acceptable thresholds were not observed in the field.

Erosion is of low to moderate concern within the project area. Although soils derived from volcanic ash are easily eroded by raindrop impacts and overland flows when bare mineral soil is

exposed, surface erosion by water was observed to be minimal within the project area due to high infiltration rates, gentle slopes and sufficient vegetative cover and organic litter layer accumulation on the surface. However, landtypes on the steeper slopes in the project area do have moderate erosion hazard ratings that reflect potential erosion rates following natural or mechanized disturbances that reduce vegetative cover, displace organic surface layers, or reduce soil porosity through compaction. Erosion losses would be very localized and would not produce sediment to surface streams or lakes.

Sensitive soils in the Flank project area include slopes greater than 30% (cindery slopes of Company Butte and the edges of the finger lava spines dissecting the planning area) and soils with micro-basin frost pockets (generally lodgepole stands at the upper end of the project area). Compliance with LRMP standard and guideline SL-5 is addressed by this project by excluding small portions of activity areas with sensitive soils on steep slopes from machine traffic.

Table 3.6.2 Areas of Sensitive Soils in the Flank Project

Area Description	Type of Sensitivity	Acres
Steep slopes on cinder cones	Displacement risk (slope >30%, loose cindery soils)	2
Concave Micro Basin	Regeneration risk (frost pocket potential)	458
Steep slopes on edges of lava flows	Displacement risk (slope >30%, loose sandy soils)	268

Based on the Deschutes National Forest Soil Resource Inventory, 1976

Existing conditions within proposed activity areas

Many proposed units within the Flank project area have had previous timber harvest activities, including primarily ground-based railroad logging used to harvest large-diameter ponderosa pine during the 1920's and 1930's. Some areas were re-entered during the 1970s, 80s and 90s for harvest prescriptions that include clear cuts (HCC), thinning (HTH) and overstory removal (HOR). The extent of disturbance to the soil resource varies between these activity periods. Although photographic evidence indicates that extensive dendritic and parallel networks of skid trails were created during the railroad era logging, soil probes and the productivity of existing black bark stands in these areas indicates that natural processes have gradually restored soil quality over the past 70 to 80 years. Visual evidence of railroad era logging facilities is variably observable due to the presence of vegetation and forest litter. Skid trails from more recent mechanical harvest are identifiable on the ground and retain detrimentally compacted conditions.

Proposed activity areas with only past railroad logging activities have low levels of existing detrimental disturbance. Although primarily dendritic skid trail patterns were created by these entries, a small number of areas had parallel skid trails from high lead yarding off rail cars. Regardless of pattern, frost heaving, freeze-thaw cycles, root penetration, and rodent activities appear to have gradually restored the soil strength and porosity in the 80 plus years since their creation. Unit 27 with only past railroad logging was field monitored and measured to have 7% existing detrimental conditions.

Qualitative field observations in other proposed Flank units with only past railroad logging supported the use of the measured conditions in unit 27 as representative of their existing condition.

Twenty-five proposed Flank activity areas have had silvicultural harvest prescriptions recorded in the FACTS database implemented in more recent years. Although these activities were able to utilize the extensive system of railroad era skid trails and landings for their logging facilities in 20 of these units, additional detrimental disturbance was incurred. Existing conditions in a subset of these units were measured in the field and were used to represent existing levels of impact in the 15 other previously entered units with similar harvest prescriptions. Measured levels of existing detrimental conditions ranged from 18 to 25% in these units (table 3.6.1).

Five Flank units with machine harvest prescriptions do not have previous railroad era activities. These conditions were measured in proposed Flank unit #56, totaled 18% detrimental disturbance (table 3.6.1) and were used to represent existing conditions in the other four units. Since these conditions reflect the initial implementation of a skid trail and landing system for a thinning harvest

prescription similar to those proposed under this decision, levels of 15-19% can be expected in thinning units that have not been entered since the railroad era.

Additional information on the presence and extent of railroad era activities was also used to estimate existing conditions within units proposed for entry under this decision. Table 3.6.3 summarizes the existing detrimental disturbance for all proposed Flank units. For complete numbers by unit refer Appendix D.

Figure 3.6.1 shows the percentage of previously harvested units with levels of compaction ranging from 5 to 20 percent.

Short-term effects are changes to soil properties that would generally revert to pre-existing conditions within 5 years or less. Long-term effects as those that would remain identifiable for 5 years or longer.

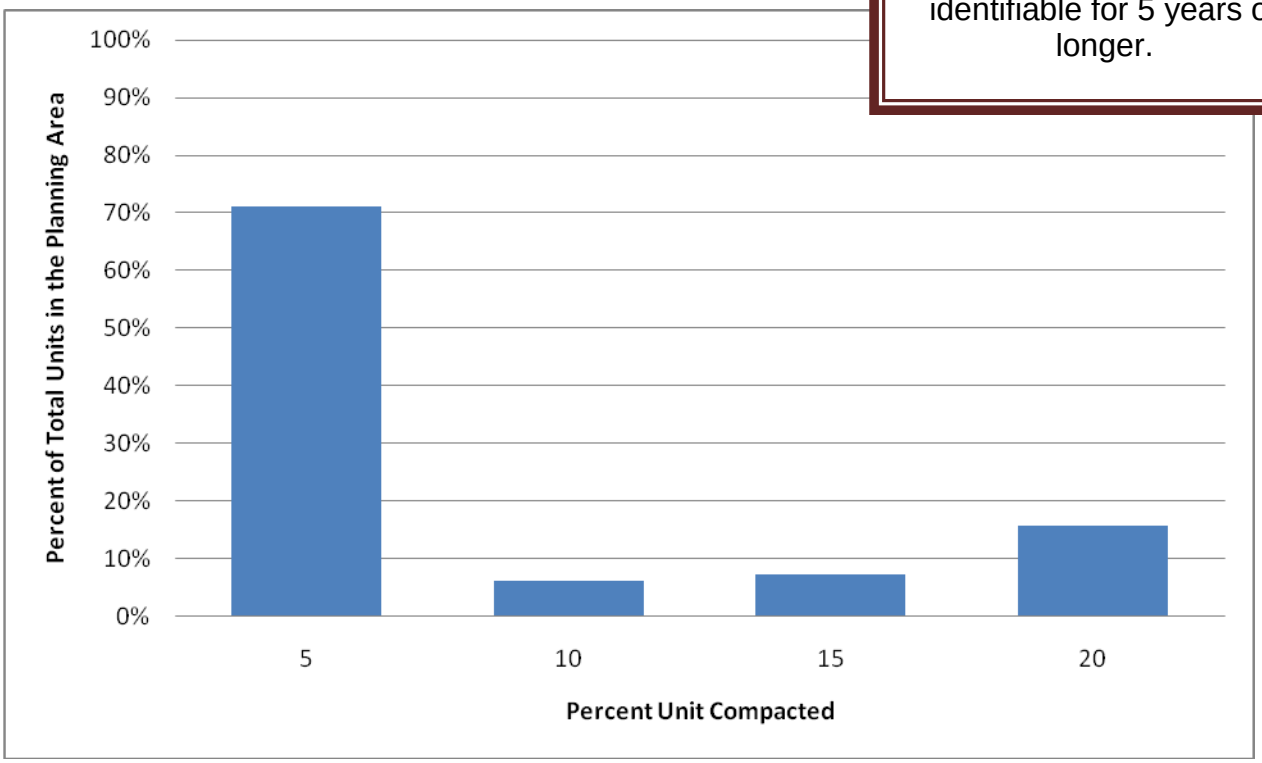

Figure 3.6.1 Percentage of Previously Harvested Units with Levels of Compaction From 5% to 20%

Coarse woody debris (CWD) is variably present throughout the project area. The majority of proposed units are homogeneous black bark stands that currently have relatively low amounts of CWD on site, all of which would be retained. Although CWD >10" may be removed as part of the contract in units identified with an HSV prescription under the proposed action, sufficient amounts would be retained in these units to provide microsite habitat for microbial functions on site.

3.6.6 Detrimental Soil Disturbance

The scope of the soil resource effects analysis is encompassed by the boundary of each unit within the project area (FSM 2520 and LRMP pg 4-71). Short-term effects are changes to soil properties that would generally revert to pre-existing conditions within 5 years or less. Long-term effects are those that would remain identifiable for 5 years or longer.

Direct and Indirect Effects—Alternative 1—Detrimental Soil Disturbance

Under Alternative 1 (No Action), the management activities proposed in this document would not take place. No additional land would be removed from production for temporary roads or logging facilities for

harvest and yarding operations. There would be no cumulative increase in detrimental soil conditions above existing levels.

Soil productivity would not change appreciably as a result of this alternative since no management induced detrimental soil conditions would occur. The productivity of the soil resource may decrease in the short term in the absence of wild or prescribed fires that provide a cyclical flush of nutrients in dry forest systems (Fire Effects Summary, 2003). Although ground fuels have been reduced in some previously managed areas, fire exclusion has resulted in undesirable vegetation conditions and excessive fuel loadings in other portions of the project area (see Fire/Fuels Section). Alternative 1 would defer fuel reduction opportunities at this time. As a result, Alternative 1 has an elevated risk of future stand-replacing wildfires capable of producing intense ground-level heating as coarse woody debris is consumed.

Wildfires under this alternative are likely to incur localized detrimental changes to soil chemical, physical, and biological properties on up to 5% of the burned over landscape, an extent observed in recent fires across the Deschutes National Forest. Although the extended duration of extreme temperatures would be expected where CWD on the soil surface was consumed, the “styrofoam” characteristic of the pumiceous ash prevents deep penetration of heat induced by fire, resulting in very short-term effects to the productivity of the soil. More pronounced direct effects are the loss of protective ground cover and the possibility of localized hydrophobicity, both of which increase the risk for accelerated wind and water erosion until the return of vegetative cover during the first few growing seasons subsequent to the fire. Localized increases in surface runoff and subsequent erosion are likely to be indirect effects as a result of wildfire under this alternative.

Although disturbed soils would continue to recover naturally from the effects of past management, the current extent of detrimental soil conditions would likely remain unchanged for the short-term.

Direct and Indirect Effects – Alternative 2 – Detrimental Soil Disturbance

The percentages of detrimental soil conditions would increase above existing conditions in all proposed activity areas. Increases in detrimental disturbance are estimated to range from 5 to 15 percent depending on the existing level of disturbance and availability of existing skid trails and landings in each activity area. Levels would increase by the largest amounts within activity areas that have low existing disturbance levels and few existing skid trails or logging facilities available for re-utilization. This would occur in units that have not had mechanical harvest since the railroad era and that currently have levels of detrimental disturbance below 10%. Units not listed in Table 3.6.3 are likely to meet the Regional guidance for the soil resource provided in FSM 2520, R-6 Supplement No. 2500-98-1 following harvest, yarding and fuels treatment activities under this decision.

Table 3.6.3 Proposed Flank Activity Units with 75% or Greater Overlap of Harvest Prescriptions from the Forest Activity Database

Flank Unit	Existing Detrimental Soil Conditions (Percent)	Railroad Logging? _percent dendritic/ parallel	Past Activity Name	Past Harvest Rx	Percent overlap
12	20%	Y_100	Humbug Serv Cont	HTH	95
14	20%	Y_100	Little Orphan	HFR	98
16	20%	Y_100	Humbug Serv Cont	HSV	91
20	20%	Y_100	Little Orphan	HTH	98
21	16%	Y_100	Taghum Butte LP Salv	HTH	
23	19%	Y_100	Humbug Serv Cont	HTH	95
32	20%	Y_100	Taghum Butte LP Salv	HTH	74
33	20%	Y_90	Little Orphan	HTH	98
35	20%	Y_50_50	Humbug Serv Cont	HTH	90
36	20%	Y_100	Taghum Butte LP Salv	HTH	96
39	20%	Y_100	Humbug Serv Cont	HTH	99
47	15%	N	Taghum Butte LP Salv	HTH	96
50	15%	N	Orphan Sale	HPR	86
53	20%	Y_80	Little Orphan	HSV	97
56	15%	N	Little Orphan	HTH	98
59	15%	N	Humbug Serv Cont	HTH	97
67	18%	Y_100	Tepee	HOR	99
70	20%	Y_64_40	Tepee	HOR	93
75	16%	Y_80	Orphan Butte	HCC	96
76	20%	Y_90	Orphan Butte	HCC	97
78	20%	Y_70	Orphan Butte	HCC	94
79	15%	N	Evans West	HSV	91
80	15%	Y_80	Hunter Butte/Evans West	HFR/HSV	91
81	20%	Y_90	Hunter Butte	HFR	100
88	15%	Y_30_70	Ina Salvage	HCC	82

Approximately 373 acres are currently detrimentally impacted within the previously entered units. This is a conservatively high estimate that averages 20% of the unit area acreage. Although skid trails and landings are available for re-use under this entry, the activities proposed under Alternative 2 are likely to increase the acres of detrimental conditions by an estimated 19 to 38 acres (average of 5% to 10% of the unit area acreage) as a result of implementing harvest and fuels treatments in units with previous entries (Craigg, 2000). Additional soil compaction would account for the majority of these impacts. Impacts from fuels treatments proposed under this alternative are not expected to incur any additional detrimental impacts within these or any other units due to restrictions of mechanized equipment used for piling to existing areas of impact or operations over conditions of frozen ground.

All proposed activity units in which ground-based machinery was utilized for harvest and yarding would be expected to meet LRMP standards for maintaining soil productivity.

Direct and Indirect Effects—Alternative 2—Detrimental Soil Disturbance – Harvest Effects:

The nature of the direct effects to the soil resource would be similar within all units utilizing ground-based equipment to accomplish management objectives. Research studies and local soil monitoring show that soil compaction and soil displacement account for the majority of detrimental soil conditions resulting from ground-based logging operations (Page-Dumroese, 1993; Geist, 1989; Powers, 1999; Deschutes Soil Monitoring Reports). The primary sources of detrimental soil conditions observed from harvest activities on the Forest are from repeated mechanized traffic for timber harvest and yarding activities, which can incur detrimental compaction when more than 3 to 5 equipment passes over the same piece of ground (McNabb and Froehlich, 1983). The majority of detrimental impacts to the soil resource would occur as compaction of mineral soil on heavy use areas such as temporary roads, log landings, and main skid trails, where soil strength would be expected to be increased to levels capable of affecting root growth, water infiltration, and moisture holding capacity on site.

The extent of detrimental disturbance incurred by this entry is dependent on the logging infrastructure necessary to accommodate the ground-based harvest, yarding and processing of commercial material. For skid trails, an average disturbed width of 12 feet and an average spacing distance between main trails of 100 feet results in coverage over 11% of the unit. Although impacts on skid trails are not always detrimental across their entire width or length, their average spacing tends to lessen as they converge toward a landing. These two variables somewhat offset each other, conservatively resulting in an average of 13% of a unit detrimentally impacted by skid trails. The estimated need for log landings under this project is a 100 foot by 100 foot landing for each 15 acres of harvest, equating to approximately 2% of the unit area. As a result, 15% of each activity area would be detrimentally impacted where logging facilities were re-used or created during this entry.

Past monitoring on the Deschutes National Forest has shown that detrimental soil conditions increase each time a stand is treated with mechanical equipment (Deschutes Soil Monitoring Reports 1996, 1997, and 1999), even with careful planning and implementation of project activities (Craigg, 2000). Additional impacts are generally a result of re-oriented skid trail networks and off trail tracks from harvester shears. Although there are opportunities to re-use existing skid trail networks and log landings, additional impacts ranging from 5 to 10% are likely to be incurred in some units that would temporarily push detrimental levels to or above LRMP and R6 Standards for maintaining soil productivity following harvest and yarding activities.

Additional detrimental impacts from off-trail traffic by harvester shears in all activity areas are expected to be localized and minimal in extent. Although the maneuvering of tracked equipment on dry ash soils can displace or mix the surface soil and organic matter with subsurface horizons, it is typically very localized and not considered to be detrimental (detrimental displacement requires an area of at least 100 square feet that is at least 5 feet in width as defined by FSM 2521.03 and the R-6 Supplement). As a result, detrimental displacement is not expected to be a measurable contributor to soil disturbance levels within proposed activity areas. Off trail traffic has been observed to incur localized additional detrimental impacts within an activity area (Lower Jack Monitoring) where the effects of one or two pass trips by the harvester shears can be additive to existing levels of compaction from previous entries. Although localized, these conditions can create additional detrimental impacts estimated to range from 1 to 3% of an activity area.

In summary, predicted detrimental conditions following mechanical harvest and yarding activities within the 25 units listed in Table 3.6.3 are likely to be near or above the 20% standard due to higher levels of existing impacts units. These units are likely to need subsoiling to restore impacts from previous activities in order to meet the LRMP standards for maintaining soil productivity. The remaining proposed Flank units are expected to meet the 20% LRMP standard for maintaining soil productivity as a result of low existing detrimental conditions. The mechanical harvest of similar thinning levels in other black bark stands on the Forest has incurred detrimental impacts on 15 to 20% of an activity area when implemented on ground with low existing impacts. Impacts within the units planned for mechanical thinning (HTH) and the removal of dead (HSV) as part of their prescription (857 unit acres) are expected to incur only slightly higher levels of disturbance from additional off trail traffic. The predicted levels of impact for these units are included in the Soils summary table in Appendix A.

Direct and Indirect Effects—Alternative 2—Detrimental Soil Disturbance – Temporary Roads:

A total of 13.5 miles of temporary road would be constructed to access and haul from 31 proposed activity units under this alternative. They would be placed on roads or skid trails from railroad era activities that are currently not detrimentally impacted (~10.7 miles) or on roads or skid trails from more recent activities that are currently detrimentally impacted (~2.8 miles) in order to access and haul from 31 units proposed for commercial harvest. These roads would be subject to multiple trips by skidders and/or log trucks and incur short term direct effects in the form of compaction and displacement on approximately 19.5 acres of non-detrimentally impacted soil and 5 acres of detrimentally impacted soil within the specific unit areas.

The amount of disturbed soil associated with temporary roads and logging facilities would be limited to the minimum necessary to achieve management objectives. All reasonable Best Management Practices (BMP's) for Timber Management and Road Systems would be applied to minimize the effects of road systems and timber management activities on the soil resource. A variety of BMP's are available to control erosion on roads and logging facilities during and after project implementation. The BMP's are tiered to the Soil and Water Conservation Practices Handbook (FSH 2509.22), which contains conservation practices that have proven effective in protecting and maintaining soil and water resource values. The Oregon Department of Forestry evaluated more than 3,000 individual practices and determined a 98 percent compliance rate for BMP implementation, with 5 percent of these practices exceeding forest practice rules (National Council for Air and Stream Improvement, 1999).

All temporary road surfaces would receive restoration treatments following their use to rehabilitate compacted and displaced conditions. Treatments would include subsoiling to de-compact subsurface and surface layers, or the use of the bucket rake of an excavator to de-compact the surface horizon, replace woody material to provide cover, and re-smooth mineral soil displaced to the edges. Subsoiling would immediately reduce the soil strength of treated acres below natural levels for the majority of the profile, from which they would gradually return to natural levels in the short term as the profile settled from snow and moisture percolation. Conditions capable of infiltrating water would be returned immediately to the treated acres, which would be set on a trajectory of recovery capable of supporting vegetation within the following growing seasons. Acres treated with the bucket rake of an excavator would also be immediately capable of infiltrating water, although the overall soil strength of the profile would take longer to return to natural conditions. Acres treated in this manner are still likely to return to a productive capacity in the short term, primarily as a result of freeze/thaw mechanisms and re-smoothing of displaced mineral soil.

Table 3.6.4 Estimates of Detrimental Soil Conditions following Mechanical Harvest, Fuels and Restoration Treatments for Recently Entered Activity Areas

Unit Number	Acres	Existing Detrimental Soil Conditions (Percent)	Estimated Detrimental Soil Conditions Following Harvest And Fuels Treatments	**Subsoiling To Reduce Detrimental Conditions to 20% (Yes/No)**
12	429	20%	25	Y
14	73	20%	25	Y
16	233	20%	25	Y
20	85	20%	25	Y
21	47	16%	21	Y
23	88	19%	24	Y
32	25	20%	25	Y
33	53	20%	25	Y

Unit Number	Acres	Existing Detrimental Soil Conditions (Percent)	Estimated Detrimental Soil Conditions Following Harvest And Fuels Treatments	**Subsoiling To Reduce Detrimental Conditions to 20% (Yes/No)**
35	25	20%	25	Y
36	20	20%	25	Y
39	281	20%	25	Y
47	23	15%	20	N
50	68	15%	20	N
53	41	20%	25	Y
56	86	15%	20	N
59	152	15%	20	N
67	71	18%	23	Y
70	66	20%	25	Y
75	13	16%	21	Y
76	9	20%	25	Y
78	5	20%	25	Y
79	12	15%	20	N
80	62	15%	20	N
81	19	20%	25	Y
88	39	15%	20	N

Direct and Indirect Effects—Alternative 2—Detrimental Soil Disturbance – Fuels Treatments:

All proposed fuels treatments are expected to result in minimal additional impacts to the soil resource.

Machine piling on landings is likely to occur within all commercially harvested units as part of piling material accumulated on landings. Machine travel for piling on landings would occur on ground already impacted by logging traffic and would not result in a net increase in detrimental soil conditions.

Grapple piling of concentrations of down material in excess of LRMP fuels loadings may also occur following mechanical harvest in some units. Project design features would restrict the operation of this machinery to skid trails utilized or created by the harvest activities. Although machine traffic would be limited to skid trails used for yarding, isolated travel where machines maneuvered off the edges of the landings and skid trails over areas where excavator harvesters had previously operated to cut and accumulate material could minimally increase detrimental conditions within the units. As a result, potential increases to detrimental conditions from machine piling are not likely to be measurable.

Project design features also restrict the location of machine piles to landings and skid trails where possible. Burning large landing piles would incur elevated ground-level heating capable of volatilizing soil nutrients and altering physical soil properties. However, impacts would be localized to the footprint of the pile and overlap detrimentally compacted soil conditions incurred by the harvest and yarding operations. The burning of smaller grapple piles would also be expected to cause localized impacts to the soil resource in areas that overlap detrimentally compacted conditions. These piles would be located on detrimentally compacted skid trails and, although these piles would be smaller in size than landing piles, ground-level heating would still be capable of volatilizing nutrients, albeit to a lesser degree. As a result, localized detrimental conditions identified from burning landing or grapple piles would not be additive to the totals incurred from harvest operations.

Lop and scatter, hand thinning and hand piling treatments are not expected to incur detrimental impacts on the soil resource. Units 21, 34, 37 and 65 would be hand thinned with chainsaws and hand piled, incurring no additional detrimental impacts to the soil from these activities. Piled slash would be

burned and may incur localized impacts to the soil resource. The burning of hand piles is expected to cause minimal detrimental impacts to the soil resource since the piles are relatively small and loosely compressed, generating ground-level heating that is usually not elevated long enough to volatilize nutrients or detrimentally alter soil properties that affect long-term site productivity. Soil under these types of piles has been observed to be covered with the moss *Funeria hygrometrica* after the growing season following burning, indicating relatively steady recovery of these areas. Piles generated and burned in these units have the potential to impact approximately 0.01 acres (<1%) of the soil resource as a result of elevated temperatures and heat penetration into the soil profile.

Mowing activities are proposed within a number of the proposed activity units (~289 acres) to reduce the heights and continuity of the brush component prior to underburn prescriptions. This activity is not likely to cause detrimental soil displacement and increases in soil bulk density appear to be inconsequential from single pass traffic by the ASV tractor (Soil Monitoring Report, 1997). The primary factors that limit soil compaction and displacement are the low ground pressure of the tractor, the limited amount of traffic (one or two equipment passes), and the variable cushioning effect of surface organic matter.

Prescribed fire would be used to reduce fuel accumulations in the majority of activity areas proposed for mechanical harvest and pre-commercial thinning (~4,902 unit acres). Detrimental impacts to the soil resource are expected to be very localized in extent (<1%) under post harvest conditions that have reduced stand densities and fuel loading within the activity areas to levels within a range receptive to the spread of low to moderate intensity fire. Planned ignitions would also occur within applicable LRMP standards and guidelines and under Best Management Practices (BMPs) included in prescribed burn plans to minimize effects to the soil resource. Prescribed burn plans would include soil moisture and duff retention guidelines to minimize the risk for intense ground-level heating and exposure of mineral soil. It is expected that adequate retention of fine organic matter (litter and duff layer) would remain on the surface following burn operations for protecting mineral soil from erosion and supplying nutrients for vegetative and soil microbial growth.

Although mowing operations would add fine fuels to existing levels of natural fuel accumulations on the soil surface within activity units 20, 50, 56, 75, 76, & 78, shrub heights and continuity would be reduced to minimize subsequent flame heights generated during a burn. Natural and mowed fine fuel accumulations (i.e., decadent brush, tree branches, and needle cast litter) typically do not burn for long durations or cause excessive soil heating (Maxwell, Ward, 1980). Effects to the soil as a result of soil heating during burn operations are expected to be minimal under the fuel type (grass, brush, trees), density, and nature of the litter and duff layers (thickness, moisture content) present at the time of ignition.

The risk of elevated soil heating during prescribed burn operations is localized to areas underneath coarse woody debris (CWD). Although high-to-extreme fire hazard and potential for excessive soil heating exists when CWD on the surface exceeds 30 to 40 tons per acre (Brown et al., 2003), overall levels of CWD prior to the implementation of prescribed burning are expected to range from about 5 to 12 tons of per acre over most of the activity areas (Flank Fuels specialist report). Soil heating is likely to be minimal regardless of the season of burn since higher moisture levels are generally present during spring burns and fall burns would be conducted following brief periods of precipitation. Prescribed burns also incur a risk of excessive consumption of CWD present on the soil surface. This risk is relatively low since low-intensity prescribed burns do not readily consume material much larger than 3 inches in diameter, and charring does not substantially interfere with the decomposition or function of CWD (Graham et al., 1994). As a result, it is expected that there would be little or no detrimental changes in soil properties or CWD levels from prescribed burning.

Direct effects to the soil resource from implementing prescribed burns includes the construction of containment line. Line would be constructed by hand or with a low-ground pressure ATV machine pulling a small wedge-shaped plow to expose mineral soil in widths of approximately 1.5 and 3 feet, respectively. Soil compaction is not a concern because this activity would be accomplished with a single equipment pass or hand tools. Although vegetative and surface organic cover would be removed from these areas the extent of soil disturbance associated with machine and hand line activities would not remove surface organic layers in large enough areas, at least 5 feet in width as defined in FSM

2520, to qualify as detrimental soil displacement. The impacts would also be mitigated to some degree by the redistribution of displaced topsoil and unburned woody debris over mechanical fire lines following prescribed burning activities. Litter from adjacent trees, coupled with the establishment of herbaceous grasses, forbs, shrubs, and tree seedlings over time would provide new sources of fine organic matter for humus development in the mineral soil on either machine or hand created lines. The extent of disturbed soil would be limited to the minimum necessary to achieve fuel management objectives and is estimated to be <1% of any one activity area.

Soil Restoration Treatments on Logging Facilities and Temporary Roads

Soil restoration treatments would be applied under alternative 2 to comply with regional policy if anticipated cumulative levels of detrimental soil conditions exceeding 20% are incurred within proposed activity units. The Soil restoration treatments may be applied under alternative 2 to comply with regional policy in order to reduce the cumulative levels of detrimental soil conditions anticipated from this project proposal. Individual activity areas listed in Table 3.6.4 are likely to need soil restoration treatments (subsoiling) to de-compact primary skid trails and landings following proposed activities in order to comply with LRMP standards SL-3 and SL-4, and Regional policy under FSM 2520 and R-6 Supplement No. 2500-98-1 for maintaining or enhancing soil productivity. Subsoiling would likely need to be applied across a minimum of 19 acres of detrimentally compacted soil on primary skid trails, landings and all temporary roads within these units to reduce the cumulative amount of detrimentally compacted soil.

Subsoiling restoration treatments would also be implemented to decommission temporary roads where appropriate conditions allow for effective operations. Rehabilitation of temporary road surfaces could also utilize the bucket rake of an excavator to de-compact the surface, replace woody organics to provide organic cover, and the replace and re-smooth any mineral soil displaced to the edges. A total of 24 acres of temporary road would be created and decommissioned under this alternative.

Subsoiling activities would be implemented with a self-drafting winged subsoiler to reclaim and stabilize detrimentally compacted soil on temporary roads and some of the primary skid trails and log landings following post-harvest activities. The winged subsoiling equipment used on the Deschutes National Forest has operated with good success where rock fragments are absent on the surface and minimal within the soil profile. Although rock fragments can limit subsoiling opportunities on some landtypes, hydraulic tripping mechanisms on the winged subsoiler help reduce the amount of subsurface rock potentially brought to the surface by other tillage implements and allow for operations in soiltypes with some fractions of rock present in the soil profile. Although surface soils within the project area are variably suited for tillage treatments due to the presence of rock fragments within the soil profiles, machine harvest units all have conditions suitable for subsoiling operations to occur if necessary.

The effects of subsoiling on the soil resource are primarily the fracturing of compaction located at various depths in the soil profile. This specialized equipment has been shown to lift and shatter compacted soil layers in greater than 90 percent of the compacted zone with one equipment pass (Craigg, 2000). Some displacement and mixing of surface organic matter can occur from these operations despite the clearance between the tool bar and the surface of the ground that generally allows smaller logging slash to pass through without building up. The process can also bring rocks located in the soil profile to the surface. However, material that is moved and mixed is not removed off site and generally does not result in detrimental soil displacement. Since the winged subsoiler produces nearly complete loosening of compacted soil layers without causing substantial displacement, subsoiling treatments are expected to reduce soil strengths below threshold values that affect productivity and set the soil resource on a path to pre-impact status within the short-term (less than 5 years) through natural recovery processes.

Although the biological significance of subsoiling is less certain, these restoration treatments likely improve subsurface habitat by restoring the soils ability to supply nutrients, moisture, and air that support soil microorganisms. Research studies on the Deschutes National Forest have shown that the distributions and composition of soil biota populations rebound back toward pre-impact conditions following subsoiling treatments on compacted skid trails and log landings (Moldenke et al., 2000).

Subsoiling would be a restoration activity intended to improve physical soil and hydrologic conditions to levels better capable of supporting trees and other vegetation. This operation directly reduces soil strengths to levels at or below natural levels present before compaction from multiple machine passes occurred. As a result of these treatments, all activity units are expected to meet the Regional guidance for the soil resource provided in FSM 2520, R-6 Supplement No. 2500-98-1 following harvest, yarding and fuels treatment activities.

Direct and Indirect Effects—Alternative 2—Detrimental Soil Disturbance – Sensitive Soils

The majority of activity areas proposed for mechanical vegetation treatments do not occur on landtypes that contain sensitive soils. Portions of proposed activity areas listed in Table 3.6.5 contain sensitive soils exceeding slopes of 30% (SRI landtype 14 mapped within complex LG) where the ash soils have a high hazard rating for surface erosion when cover is lost or mineral soil disturbance occurs, and a high risk for displacement from mechanized traffic. Site-specific project design criteria restricting operation of machinery on steep slopes, as well as favoring these slopes for designated wildlife leave areas, would mitigate potentially adverse effects to soils defined by landtype 14.

Portions of the planning area include soils located on flat or concave microbasins that are subject to cold air drainage capable of affecting regeneration (SRI landtype 6B & 72). Approximately 438 acres of landtype 6B essentially defines the lodgepole plant community along the higher elevation southern boundary of the of the project area. Units within these areas are not a concern for regeneration since they would remain fully stocked following thinning and salvage treatments. Approximately 19 acres of landtype 72 are mapped at the northwestern fringe of the planning area within proposed Flank unit #2. This appears to define the upper end of a lower lying area at the fringe of the forest. Unit layout, design criteria and treatment prescriptions are mitigation measures intended to avoid the need for any re-planting within areas defined by these landtypes.

Table 3.6.5 Sensitive Soils in the Flank Proposed for Vegetation Treatments

Management Concern	Alternative 2
Soil displacement on slopes >30% [Landtype 14 (LG)]	Units: 23,26,27,35,37,38,42, 54,55,56,57,58,83
Regeneration in cold air drainages [Landtype 6B & 72]	Units: 2,33,46,47,49,50,51, 52,53,57,60,61,83

Direct and Indirect Effects – Alternative 3 – Detrimental Soil Disturbance

Direct and Indirect Effects—Alternative 3—Detrimental Soil Disturbance – Harvest Effects:

Direct and Indirect effects to the soil resource under Alternative 3 would be the same as those described for Alternative 2 within units proposed for silvicultural prescriptions (HTH and HOR) using mechanical ground-based equipment and/or fuels treatment prescriptions (MP, MST, UB, LOP & LFR). Detrimental disturbance to the soil resource would be the same within the 5,341 acres proposed for mechanical thinning (HTH) and the 251 acres proposed for mechanical overstory removal.

No direct effects to the soil resource would occur under Alternative 3 within the 857 unit acres proposed for a salvage prescription (HSV) under Alternative 2. These areas would remain in their current condition for existing detrimental disturbance described in the unit summary table (Appendix A). Existing and potential fuel loads within these units would not be reduced, which could indirectly affect

the soil resource in both the short and long term by increasing the behavior, intensity and duration of wildfire through heavy accumulation of down woody debris. However, although these changes in fire characteristics have the potential to incur detrimental burn damage to the soil resource, it would be expected to occur over a relatively low percentage of the actual acreage. Recent wildfires across the Deschutes have generally been observed to incur detrimental burn damage over less than 5% of the actual fire acreage, primarily directly underneath down logs lying directly on the soil surface.

Direct and Indirect Effects—Alternative 3—Detrimental Soil Disturbance – Temporary Roads:

Alternative 3 would have the same number and location of temporary roads as described for Alternative 2, incurring the same short term effects to the soil resource over 19.5 acres of non-detrimentally impacted and 5 acres of detrimentally impacted ground.

Direct and Indirect Effects—Alternative 3—Detrimental Soil Disturbance – Fuels treatments:

Fuels treatments would remain the same in all units proposed for HTH or HOR silvicultural prescriptions under this alternative. As a result, all direct or indirect effects to the soil resource as a result of fuels treatments under Alternative 3 would be the same as those described under Alternative 2.

Direct and Indirect Effects—Alternative 3—Detrimental Soil Disturbance – System Roads:

Alternative 3 proposes to close and decommission approximately 3.6 miles of road. This action would administratively close 2.3 miles of native surface roads to public use and decrease motorized traffic on approximately 8.7 acres of the soil resource. There is likely to be little measurable change to the physical soil condition in the short term on these roads, although there could be a slow amelioration of compacted conditions and vegetation may begin to encroach from the edges and between the tracks of the road. The 3.6 miles of road proposed for decommissioning may utilize a subsoiler to de-compact the surface and subsurface horizons and obliterate the road surface. This action would rehabilitate approximately 6.5 acres of the soil resource within the planning area from a detrimentally compacted condition to one capable of infiltrating water and supporting vegetation.

3.6.7 Coarse Woody Debris & Surface Organic Matter

Direct and Indirect Effects—Alternative 1—Coarse Woody Debris & Surface Organic Matter

Under Alternative 1, the amount of coarse woody debris and surface organic matter would increase over time from current levels at a rate dependent on mortality rates of the stands, as well as natural wind events to move snags to the ground. The lodgepole stands currently have a relatively high rate of mortality and there is a ready supply of dead trees capable of becoming CWD during a wind event. The accumulation of CWD and forest litter in the short term would increase the risk for wild land fires and subsequent cumulative effects to the soil resource. The black bark stands of Ponderosa Pine currently have lower rates of mortality and fewer snags to become CWD in the short term. However, these stands are susceptible to mortality agents at current stocking levels and are likely to provide an increasing source of snags and CWD in the long term.

In the short term, the amount of coarse woody debris and surface litter are likely to increase through natural mortality, windfall, and recruitment of fallen snags over time. Short-term nutrient sources would also increase through the accumulation of small woody material from shrub and tree branches, annual leaf and needle fall, and decomposition of grass and forb plant materials. Black bark stands currently have low levels of CWD on the ground and snags or dying trees in the stand. These areas would be much slower to accumulate CWD and would likely maintain the existing levels for an extended period of time.

In the long term, the accumulation of CWD in the lodgepole stands and forest litter throughout the planning area would increase the potential for intense wild land fires capable of consuming heavy concentrations of fuel and ground cover vegetation. High-to-extreme fire hazard and potential for excessive soil heating exists when downed woody debris exceeds 30 to 40 tons per acre (Brown et al.,

2003). Intense ground-level fire can adversely affect ground cover conditions and create localized areas of severely burned soil underneath consumed CWD. There would likely be a short-term increase in the potential for accelerated wind erosion and water runoff under this alternative. The loss of organic matter would be a short term impact since the nutrient transformations as a result of recent fires have been observed to generate substantial herbaceous re-growth during the first few growing seasons (B&B, Evans West fires). Over time, burned areas not salvaged would have increased levels of CWD as fire killed trees are recruited to the forest floor.

Direct and Indirect Effects – Alternative 2 – Coarse Woody Debris & Surface Organic Matter

The measure for CWD and surface organic matter was evaluated qualitatively based on the probable success of implementing recommended guidelines and appropriate Best Management Practices (Chapter 2 Mitigation) that address adequate retention of these important landscape components to meet wildlife habitat objectives (see Chapter 3, Wildlife Section). A minimum amount of 5 to 10 tons per acre of CWD on ponderosa pine sites and 10 to 15 tons per acre on mixed conifer or lodgepole pine sites is recommended to ensure desirable biological benefits for maintaining soil productivity and providing habitat without creating an unacceptable fire hazard. Existing CWD on the ground would be protected from disturbance and retained on site to the extent possible. Lodgepole or ponderosa pine CWD that has fallen to the ground proximate to the time of harvest could still be sound enough for utilization.

The proposed harvest activities would reduce potential sources of future CWD by whole-tree harvesting and yarding material from the site. However, thinning prescriptions would leave sufficient numbers of live trees per acre from which a few per acre could potentially become snags and/or CWD through natural mortality or windthrow. Although whole tree yarding would also move the majority of limbs and tops to the log landings, harvest activities would also recruit some finer sized CWD to the forest floor through breakage of limbs and tops during felling and skidding operations. It is expected that enough broken branches, unusable small-diameter trees, and existing CWD would likely be available after mechanical thinning activities to meet the recommended guidelines for CWD retention.

Disturbance of surface organic layers and mineral soil horizons is expected to be contained to skid trails, landing areas and portions of off trail tracks within the unit area. This extent is expected to be less than 20% of the activity unit acreage, resulting in physical soil conditions and surface organic matter levels conducive to maintaining chemical and biological productivity on site. Overall nutrient availability, mycorrhizal activity and effective ground cover are not expected to be detrimentally affected by the proposed activities.

Mowing of shrubs would cause a short term increase in the level of fine fuels on site until prescribed burn treatments consumed some portions of the mowed and existing natural fuel accumulations. Burns that occur during moist conditions help ensure adequate retention of CWD and surface organic matter since low intensity fire does not readily consume material larger than 3 inches in diameter and charring does not substantially interfere with the decomposition or function of coarse woody debris (Graham et al., 1994). Although prescribed burn treatments can produce variable mortality, these trees would be a source of CWD when they eventually fall to the ground. Depending on the rate of decay and local wind conditions, many of small-diameter trees killed by the fire could fall to the ground within the short-term (less than 5 years). Prescribed burns would also increase the short term nutrient availability in localized areas and help provide and process organic matter that supports biotic habitat for mycorrhizal fungi and microorganism populations.

Direct and Indirect Effects – Alternative 3 – Coarse Woody Debris & Surface Organic Matter

Alternative 3 would meet LRMP standards for soil productivity and comply with the recommended management guidelines that ensure adequate retention of snags, coarse woody debris, and fine organic matter following both harvest and fuels treatments. The retention of these components would provide effective surface cover, substrate for biological activity (including mycorrhizae), and available nutrients to maintain soil productivity on treated sites.

Cumulative Effects -- Soils

Past, present and reasonably foreseeable future actions listed in Table 3.1 that are relevant to the soil resource within the Flank project boundary were considered for the analysis of cumulative effects. Future management activities are assumed to occur as planned in the schedule of projects for the Deschutes National Forest. No outyear timber sales are currently scheduled within the Flank planning area. Thinning and fuels treatment activities associated with the Opine Environmental Assessment are planned for areas within the Flank project area boundary but do not directly overlay any of the activity areas proposed for treatment under the Flank project. As a result, these activities would not contribute any direct or indirect effects that could cumulatively affect the soil resource in units proposed for treatments under this decision.

The Taghum Firewood Area overlaps portions of proposed Flank units 11, 12, 13, 14, 15, 19, 20, 21, 22, 29, 30, 31, 32, 33, 34, 36, 50 & 81. Firewood cutting activities are apparent in these areas and wood cutters are allowed to drive off of system roads to load wood. Although vehicle traffic can incur detrimental impacts to the soil resource where multiple vehicle trips occur off of system roads, the majority of areas traveled by woodcutting trucks in this area were not observed to be detrimentally compacted. However, existing impacts on these woodcutter roads could combine with off-trail tracks from the harvest activities proposed within these units to cumulatively compact the soil resource to detrimental levels. As a result, the cumulative effects from the actions proposed under Alternatives 2 and 3, combined with all past, present, and reasonably foreseeable management activities could incur a slight increase in detrimental soil conditions within these unit areas.

Other foreseeable future activities include continued recreational OHV use on designated trails and standard road maintenance operations. Future soil disturbances from recreational OHV use would be confined to relatively small areas along trail edges that have a relatively minor effect on overall site productivity. Road maintenance activities would reduce accelerated erosion rates where improvements are necessary to correct drainage problems on specific segments of existing road proposed for use as a haul route. Surface erosion can usually be controlled by implementing appropriate Best Management Practices (BMPs) that reduce the potential for indirect effects to soils in areas adjacent to roadways. There are no site-specific mitigation measures or KV project activities recommended by other resource specialists that would cause additional soil impacts from ground disturbing activities. As a result, there are no major soils related concerns associated with the combined effects of these future activities.

Cumulative Effects—Detrimental Soil Disturbance

LRMP guidance identifies the activity area scale for measuring and meeting soil disturbance thresholds in order to maintain productivity. As a result, cumulative effects to the soil resource are analyzed at an activity area scale to best account for the sum of effects from past, present and reasonably foreseeable actions in places where they physically overlap. The combined extent of existing disturbances, reasonably foreseeable activities, and those anticipated from implementing the multiple activities proposed in the Flank project are summarized as cumulative within the boundary of each activity unit. Estimates of existing and predicted amounts of detrimental soil conditions for these units are displayed in Table 3.6.4.

Cumulative effects are likely to be greatest within units with the highest amount of existing impacts. Equipment operations under either action alternative would cause new soil disturbances that would be additive to existing impacts from past activities and could temporarily increase cumulative detrimental impacts above the 20% LRMP threshold for soil productivity. This is most likely to occur within units with previous entries and elevated levels of disturbance listed in Table 3.6.4. Monitoring shows that implemented harvest activities that utilize logging infrastructure from previous entries can still incrementally increase detrimental conditions between 5 and 10% of the activity area (Craigg, 2000). The proposed activities are likely to cumulatively increase detrimental soil conditions to or above the 20% LRMP threshold in most units listed in Table 3.6.2. These units are identified for restoration subsoiling treatments of previously impacted skid trails and landings in order to reduce the extent of these impacts to or below the 20% threshold following the implementation of this project.

Units with low existing impacts are not likely to have cumulative increases to detrimental soil conditions that exceed the 20% LRMP threshold. Project design elements, management requirements, and Best Management Practices (BMPs) built into this document are all designed to avoid or minimize potentially adverse impacts to the soil resource. Estimates of the extent of detrimental disturbance created on skid trails and landings in a unit with a newly implanted logging system covers approximately 15% of the unit area. The majority of existing impact in most activity areas is likely to be overlapped by the harvest and yarding components of the proposed entry and would be minimally additive to cumulatively detrimental conditions that are estimated as a result of implementing this project.

Additional cumulative effects may be incurred in all units where machinery traveling off designated skid trails and landings overlaps previous disturbance that has slightly elevated compaction levels not yet considered detrimental. As a result, detrimental impacts may occur from off-trail tracks where one or more machine passes from a harvester shear or a grapple piler maneuvering off the edge of a skid trail crosses over a track from a previous entry or activity. Cumulative impacts from this overlap are generally variable and estimated to occur over less than 3% of a unit area.

Fuel reduction treatments are not expected to cause cumulative detrimental impacts to the soil resource. Mowing machinery is not expected to incur cumulative detrimental disturbance on the soil resource due to the lower ground pressure of this machinery and minimal displacement of soil surface layers observed by these machines. Whole tree yarding to log landings would localize machine piling disturbances to landing areas and burning would occur on disturbed soils that already have detrimentally compacted or displaced conditions. Hand thinning, piling and burning of slash would cause a minimal increase in detrimental soil conditions because machinery would not be used and the burning of smaller piles would not be expected to cause severely burned soil. Prescribed burn fuels treatments would also have no cumulative effects since they would be conducted at times and under conditions that result in low to moderate intensity burns that do not cause detrimental changes in soil properties.

In summary, there would be no measurable cumulative increase in the extent of detrimental soil conditions beyond the predicted levels displayed for each of the proposed activity areas in table 3.6.5. The actions proposed under Alternatives 2 and 3 are not expected to incur cumulative detrimental soil impacts extensive enough to exceed LRMP and Region 6 standards and guidelines for maintaining soil productivity within the project area or specific activity area units. Project design features and Best Management Practices are included to minimize the cumulative effects on the soil resource from the proposed activities. The cumulative effects to the soil resource within all mechanical harvest and yarding treatment units are expected to be within LRMP standards for maintaining soil productivity following harvest, yarding and fuels treatment activities for units with low existing detrimental conditions (units not listed in Table 3.6.5). Units listed in Table 3.6.5 may need restoration subsoiling treatment of impacts from previous entries following harvest and yarding activities in order to meet LRMP standards for maintaining soil productivity.

Cumulative Effects—Coarse Woody Debris & Surface Organic Matter

As previously described for the direct and indirect effects, it is expected that Alternatives 2 and 3 would meet LRMP standards for soil productivity and comply with the recommended management guidelines that ensure adequate retention of snags, coarse woody debris, and fine organic matter following both harvest and fuels treatments. The retention of these components would provide effective surface cover, substrate for biological activity (including mycorrhizae), and available nutrients to maintain soil productivity on treated sites. As a result, there would be no cumulative effects on coarse woody debris or surface organic matter from the implementation of this project.

3.6 Botany

3.6.1 Introduction

Aggressive non-native plants, or noxious weeds, can invade and displace native plant communities causing long-lasting management problems. Noxious weeds can displace native vegetation, increase fire hazards, reduce the quality of recreational experiences, poison livestock, and replace wildlife forage. By simplifying complex plant communities, weeds reduce biological diversity and threaten rare habitats. Potential and known weeds for the Deschutes National Forest are listed in the Invasive Plant Risk Assessment on file at the Bend/Fort Rock Ranger Station in the Flank Project File.

In addition to noxious weeds, which are designated by the State, there is a group of non-native plants that are also aggressive though are not officially termed "noxious". These species are also considered in this assessment.

Although there have been many opportunities for invasive plant introductions in the past (mainly via timber harvest operations and OHV use; see Table 3.1), the issue had not reached the tipping point until the past fifteen years or so, when invasive plant populations in Bend in particular have increased exponentially. Because Bend is the nearest large community from which harvest-related vehicles and OHV's would come from or through, this phenomenon has resulted in a higher probability of weed introductions into the current project area than had previously been the case.

3.6.2 Regulatory Framework

Regulatory Framework – Invasive Plants

- FSM 2081.03 requires noxious weed risk assessments to be prepared for all ground-disturbing projects
- Preventing and Managing Invasive Plants Region 6 Decision (2005)
- USDA Forest Service Guide to Noxious Weed Prevention Practices discusses weed prevention practices that support the 1999 Executive Order on Invasive Species

Regulatory Framework – Threatened, Endangered and Sensitive Species

- Forest Service Manual (FSM) 2672.4
- Endangered Species Act of 1973 (Subpart B; 402.12, section 7 consultation)
- Regional Forester's Sensitive Species List (FSM 2670.44, January 2008)

3.6.3 Analysis Methods

Analysis Methods – Invasive Plants

A field reconnaissance of the project area was conducted in the summer of 2009. No state-listed invasive plants were located. There is an historic site of spotted knapweed (*Centaurea stoebe*) on the 1825 road adjacent to unit 80, found and pulled in 1997, which has not been seen since and can be considered eradicated.

There are patches of cheatgrass present throughout the project area. There is a larger one in particular at a wildlife guzzler located in the SW corner of unit 41. In order to prevent its spread, it is important not to park vehicles there, or use as a landing or other form of staging area.

The level of risk for the introduction or spread of noxious weeds is ranked on a scale from low, to moderate to high. This project is shows a moderate risk for invasive weed introduction.
The following eight vectors apply to this scale:

1. Heavy equipment (implied ground disturbance)
2. Importing soil/cinders
3. OHV's

4. Grazing (long-term disturbance)
5. Pack animals (short-term disturbance)
6. Plant restoration
7. Recreationists (hikers, mountain bikers)
8. Forest Service project vehicles

A high risk ranking is given when any of the following three factors are present: known weeds in/adjacent to project area, Any of vectors #1-8 in project area and project operation in/adjacent to weed population.

A moderate risk ranking is given when any of vectors 1 through 5 are present in the project area. A low risk ranking is given when any of vectors 6 through 8 are present in the project area or there are known weeds in or adjacent to the project area without any of the vectors 1 to 8.

Analysis Methods –Threatened, Endangered and Sensitive Species

A field reconnaissance was conducted in 2009 to determine if suitable habitat currently exists in the project area. From that effort, two areas were deemed suitable enough to warrant a survey.

3.6.4 Existing Condition — Invasive Plants

Existing Condition –Invasive Plants

Currently there are no known noxious weed populations in the project area.

Existing Condition –Threatened, Endangered and Sensitive Species

The area is dominated (roughly 75%) by these plant associations: ponderosa pine/ bitterbrush/Idaho fescue, and ponderosa/bitterbrush-manzanita/Idaho fescue. There are also minor components of these plant associations: ponderosa/bitterbrush/western needlegrass, and lodgepole pine/bitterbrush/Idaho fescue. Soils are generally characterized by sandy, pumiceous volcanic ash and pumice lapilli over sandy to loamy buried soils. The elevation lies at about 5000'-5600'. The average annual precipitation measures about 15 - 20".

The site lies near a population zone of the green-tinged paintbrush (*Castilleja chlorotica*), with scattered known sites occurring immediately adjacent to the project area, though none are known within the project area.

Interestingly, little of the project area offers high-quality habitat for the green-tinged paintbrush: there is dense shade in places, and not enough development of a shrub layer to act as a host. Surveys were conducted by a Forest Service botanist in one 94-acre area in the northwest corner of the project (overlaps EA units 79, 80, and the north 2/3 of 81), as well as a 188-acre area along Road 18 (overlaps EA units 73 and the west half of 74). No paintbrush or other TES species were located.

3.6.5 Direct and Indirect Effects

Direct and Indirect Effects –Alternative 1

From the standpoint of limiting invasive species establishment, the No Action alternative provides the most protection from invasive plants being introduced to the project area, because no machinery and associated vehicles would be driving over the area, creating inviting spots for invasives to germinate and thrive.

No direct or indirect effects have been identified for threatened, endangered and sensitive species because TES plant species do not exist within the project. Nor does high-probability habitat exist within the project.

Direct and Indirect Effects –Alternatives 2 & 3

The largest concern for invasive species with alternatives 2 and 3 is that weed parts or seeds may be brought into the project on the equipment used to implement the project. This includes water tenders

that would bring in water for dust abatement. Existing landings and skid trails would be reused for the Flank project, and are not known to contain weeds. In the event that weeds are found there, the site would not be used. Also of note is that the ground is relatively flat in this area, which reduces the amount of soil displacement during harvest operations, and thus the potential for weed spread or introduction.

The mitigations requiring clean equipment in the project area and to inspect water intake sources for dust abatement are helpful in preventing this; despite this, the risk is not reduced to zero. The proposed action contains risk of weed invasion or spread, although the mitigations would reduce, but not eliminate, that risk.

No direct or indirect effects have been identified for threatened, endangered and sensitive species because TES plant species do not exist within the project. Nor does high-probability habitat exist within the project.

3.6.7 Cumulative Effects

Cumulative Effects – Invasive Plants

The scale of analysis for this section is the project boundary, so chosen because it offers a landscape of reasonable size in which to determine effects. Because the project area is currently clean from a state-listed invasives plant standpoint, there are no identifiable cumulative effects from implementation of either of the action alternatives.

There are no Standards and Guidelines included in the 1990 Deschutes National Forest Land and Resource Management Plan addressing the weed issue.

The Flank project meets the Forest Service Manual direction stating that for any project with a moderate to high risk of weed invasion, control measures must be in place. Flank has a moderate risk, and control measures are in place that addresses that concern.

Cumulative Effects– Threatened, Endangered and Sensitive Plants

The scale of analysis for this section is the project boundary, so chosen because it offers a landscape of reasonable size in which to determine effects.

The type and scale of Forest Service management actions previously occurring in the Flank project area, as referenced in Table 3.1, consist of numerous harvest-related projects. These projects, which were canopy-reducing in nature (although the canopy presently tends to be more closed), would have benefited habitat for the green-tinged paintbrush. The fact that none were found in previous sensitive plant surveys, and were not found in 2009 either, indicate that there are likely other factors at work in Flank which do not favor establishment and maintenance of this species. It may be factors such as soil chemistry, soil substrate, or a lack of a developed shrub layer, but at any rate the Flank landscape does not appear to want to support this species. There are no cumulative effects as a result of past present and reasonably foreseeable future actions and either of the proposed Flank action alternatives because TES plant species do not exist within the project. Nor does high-probability habitat exist within the project.

The Flank project with regards to TES plant species is consistent with the Deschutes LRMP (1990). Records were checked for previously known TES plant populations (TE-1); suitable habitat was located (TE-2); and a field reconnaissance was performed to try to locate populations within the project area, and at the proper time of year when TES plant species in question would be found (TE-3). The remaining standards and guidelines for TES plant species do not apply to the Flank project.

3.7 Range

3.7.1 Introduction

This report addresses the proposed actions of treating 5600 acres with commercial and small tree thinning, conducting salvage and overstory removal as necessary, performing road maintenance and reconstruction activities on haul routes, and reducing fuel loads to meet Forest Plan standards and Guidelines using appropriate fuels treatments.

3.7.1 Regulatory Framework

- Forest Service Manual (FSM2200)
- Deschutes National Forest Land and Resource Management Plan

3.7.2 Analysis Methods

Beginning in the middle of the 1950's, long-term rangeland monitoring plots were established in the form of Current Trend Study Plots (CTs). Monitoring has occurred over time at irregular intervals based mainly on budget allocations and program priorities. The monitoring that was accomplished provides a valuable window into the responses of native and exotic vegetation to livestock grazing, livestock grazing in conjunction with other vegetation management activities, and to livestock grazing and impacts due to wildfire.

Allotment Management Instructions have been developed for each allotment and they are monitored using allotment Inspections, utilization studies/checks, and current trend studies.

3.7.3 Existing Condition

Livestock grazing in the Flank Project Area has provided an economic resource for local communities for many decades. All of the project area is within an active grazing allotment. Active grazing allotments are where a term grazing permit has been issued to a permittee and where grazing is being permitted annually as agreed to by the permittee and the Forest Service.

Livestock grazing on public lands has become a major issue in states with large areas of public lands. Many rural families depend on federal grazing permits for production of forage used by private livestock herds. Increased use of public lands in the West has resulted in a number of conflicts between environmental groups and livestock permittees. Livestock grazing, however, is one of the few tools available to natural resource managers for developing and maintaining desirable plant community structure, decreasing fuel loads to decrease wildfire risks, and regulating nutrient cycling in the ecosystem (CAST 2002).

Livestock operations usually require "improvements" to facilitate the control of livestock and to allow for controlled vegetation management. Existing range improvements within the project area are displayed in table 3.7.1.

Table 3.7.1 Range Improvements in the Flank Project Area

Improvement Type*	INFRA Number	Unit(s)
Pasture Division Fence	01030527 01030516	5 miles 1.5 miles
Watersets	N/A	6 each
Current Trend (CT) – 5, study plot	N/A	1 each
Current Trend (CT) – 6, study plot	N/A	1 each
Cattleguards	(Engineering)	3 each
Wire Gates	N/A	6 each

The Cinder Cone Allotment is located at T19S., R13E., and extends east and south to T21S., R15E. The allotment is 46,431 acres, with 5600 acres in the Flank Project Area. The Allotment consists of seven pastures. The allotment is a seven pasture rest-rotation grazing system. The Cinder Cone Allotment is designed to operate at the upper limit of 600 C/C pairs from 6/1 – 9/21, but is operating around half the allocated numbers at 266. This current number reflects the operating capacity of the permittee.

A grazing system on this allotment has been established to provide for a rest-rotation pattern of use on natural rangeland ecosystems. The system applied allows for full rest of at least one pasture in each allotment per grazing season and use on each pasture is rotated (occurs at a different time period) during the grazing season from year to year. These strategies allow for grazed plants to periodically complete one season or growth stage unencumbered by domestic livestock. The grazing program for this allotment is designed to utilize natural rangeland production. The objective is to manage rangeland vegetation on a sustainable basis to not only provide feed for grazing livestock, but also to hold soil in place, to filter water, and recycle nutrients.

Three out of seven pastures are in use on the Cinder Cone Allotment. The Fringe, Square, and Trails Pastures are managed under a rest-rotation system. The Orphan Pasture currently has no fence along its western boundary to prevent livestock from wandering off the allotment and into the Newberry National Volcanic Monument which is less than two miles away. Livestock are not allowed in the NNVM and allowing use in the Orphan Pasture without a fence would be contrary to that objective. The fence along the western boundary is approved, but has not been constructed due to financial constraints of the permittee. The Evans Pasture was used until the 1996 Evans West Fire burned through the area. Due to massive tree plantings in the pasture, it has been in non-use status since 1996. The Hunter and Stairstep Pastures have not been in the rotation as they have areas without fence line to keep the cattle on the allotment.

There is no livestock water available on the allotment. All water is hauled onto the Allotment via trucks at the permittees expense. There are six historic watersets in the project area.
An Environmental Assessment (E.A.) and Allotment Management Plan (AMP) were completed for the Cinder Cone Allotment in 2004. The E.A. considered use by cattle as beneficial to the winter and

spring range for mule deer as cattle prefer grasses and forbs over shrubs and use of the vegetation community would encourage shrub production over grasses and forbs.

The forage conditions on this allotment are in fair to good condition. The majority of the range is in good condition in that it is providing good forage production while maintaining quality native habitat and meeting other resource objectives such as providing mule deer winter habitat. Much of the allotment is classified as transitional range due to the overstory of lodgepole pine, ponderosa pine, and bitterbrush. Some of this overstory is becoming mature in age class and each year the understory (grasses and forbs) are subject to greater and greater competition. Forage quality is continuing to decrease with non-use in the Orphan and Evans Pastures.

Idaho fescue is the primary grass species available to cattle on the allotment under analysis. Idaho fescue is a perennial bunch grass that begins new growth early in the spring, produces seed in mid July, and goes dormant in the fall. Based on the life cycle of Idaho fescue and palatability of the plant, grazing is permitted during the growing season between June and September each year. Idaho fescue is the key indicator species for pasture management. In order to utilize the existing forage resource on these public lands, the 1990 LRMP (page 4-50) allows for cattle to remove up to 50 percent of the annual growth on Idaho Fescue.

There are small areas, primarily watersets, within the project area that have been heavily used by livestock over a long period of time, are detrimentally compacted, and have plant communities that contain cheat grass and fewer species of plants than adjacent areas. The number of these areas is minimized through management to control impacts. The same watersets are used each season as needed to achieve proper livestock distribution. Occasionally watersets are rested by altering pasture use or by using alternative sets, or using fewer sets with reduced herd size when that can be achieved to allow for some recovery.

3.7.4 Direct and Indirect Effects

Direct and Indirect Effects –Range –Alternative 1

This Alternative would allow vegetation conditions to continue to change in a direction that would not be beneficial to livestock forage production over the long run. Without the influence of a catastrophic event such as wildfire, ecosystems within the Flank Project Area would continue to evolve into older but “foreign” climax communities that are outside the specified historic range of variability. Canopy closure would increase and forage species such as Idaho Fescue and PUTR (antelope bitterbrush) would decline. The expected result would be decreased availability of forbs, grasses and shrubs. The status of existing roads would not be changed and access for permittees would be the same.

Direct and Indirect Effects – Range–Alternative 2

Alternative 2 is similar to alternative 3, with the only differences being that alternative 2 would not close or decommission any roads; alternative 2 would salvage 857 acres; and alternative 2 would not explicitly create 15 acre gaps in the PFA.

Alternative 2 would improve existing range conditions once recovery from project activities begins. Over the long term, project implementation would be beneficial to rangeland management. The status of existing roads would not be changed and access for permittees would be the same. Other direct and indirect effects from this alternative would be the same as in Alternative 3.

Direct and Indirect Effects – Range–Alternative 3

The Flank Project would implement large acreages of forest health treatments over most of the Orphan Pasture and parts of the Fringe and Square Pastures. Cattle would utilize treatment areas differently depending on the size of the treatment areas, pattern of the treatment areas, the type of vegetation area treated (forested vs. shrubland), timing of treatment and a number of other factors. Their pattern of use after treatment can be complex, but in general the larger the area treated, the less the opportunity for any conflicts in reaching desired project objectives and goals. Forest health and livestock grazing objectives can coexist to achieve multiple resource goals. Cooperative efforts by

permittees, rangeland managers, timber personnel, and fire personnel can mitigate potential effects by properly managing the scale, timing and frequency of both grazing and fuel treatments.

Implementation of treatment activities under Alternative 3 would in general benefit rangelands by increasing forage over the long run. This would be accomplished by reducing tree and shrub overstory and therefore reducing competing vegetation that would allow grasses and forbs to increase. The implementation of fire, thinning, and mowing would reduce the density of invasive species such as juniper, slow the conversion of mixed shrubland communities to forested communities and reduce the potential for high intensity fast moving wildfires by reducing fuel loading.

The majority of the Flank Project Area covers the Orphan Pasture of the Cinder Cone allotment. This allotment has not been used since 2002 as there is no fence on the west side to keep cattle from moving onto the Newberry National Volcanic Monument. The fence is approved for construction but has yet to be built by the permittee.

Small areas of the Square and Fringe Pastures are included in the project area. Both of these pastures are available for grazing from 6/1 – 9/21 and could be affected if there are sections of fence that are removed for equipment access. Coordination with the Forest Range Manager would alleviate these concerns so cattle would not be in an allotment during the time a fence is removed.

Implementation activities can occur simultaneously with livestock use under most situations by communication with operators and permittees. Closing pasture gates, using increased caution when heavy equipment share roads with livestock or ranch vehicles, and being aware of potential hazards such as the possibility of livestock in the roadway, generally mitigates conflicts. There should be no effect on the normal rest-rotation system being used for the pastures in the Cinder Cone Allotment.

Fires, fuel treatments, logging activities, planting activities and other management activities continually alter forage production on specific locations. Often, these activities provide drastic increases in available forage for periods of two to twenty years. This is known as transitional range (for livestock) and is a prevalent element in forested east-side vegetation communities and on the Cinder Cone Allotment.

The roads that are planned for closure and decommission would not affect the permittee as there are still roads that access the allotment as well as the water sets. Livestock grazing operations, including all range improvements, need to be considered in the Flank project by incorporating range project design criteria (PDC) for fuel and vegetation treatments. The desired approach is through the development of an implementation plan (IP) (PDC-1). The purpose of the IP is to outline accepted procedures so that project activities do not adversely impact other resources. It is critical that the IP is applied to project activities and that it is adaptive in nature so that both fuels, silviculture and range objectives can be met without impacting the ongoing activities and future needs of each resource area, or the affected public. It is important for example that if vegetation project activities occur during an active grazing season {up to 266 head of cattle (cow/calf pairs) are permitted between 6/1 to 9/21 on the allotment}, all gates must be closed on pastures where livestock are present by contractors and administrative personal (PDC-2, place in contract language).

If fences are included within treatment units, including along boundaries, ensure that their integrity be maintained during harvest activities and into the future (PDC-3). Rangeland management asks that this be done by means such as not cutting live trees that provide support for fences and in Leave Tree Marking Units (LTM's), painting these trees orange. In the case of dead or dying trees, cut trees a foot or so higher than the existing fence (50" minimum above the ground: high side of ground slope) so that their "stumps" can continue to support the fence structure. Cutting trees 50" or higher above the ground would include "targeting" all dead or dying trees where ever possible as they are a liability to the range improvement. If possible during the sale process, remove all dead or dying trees 50' along either side of the fence. Range would like to see this as part of the silvicultural prescription and/or contract specifications (PDC-11).

All fences within the project area need to be protected regardless of their condition.

Although the planned implementation of vegetation and fuels treatments would occur on only small portions of the Fringe and Square Pastures, personnel would require access and could potentially conflict with livestock operations by shared and increased use of roads and road systems during activities such as harvesting, equipment hauling, log hauling, burning operations (threat of fire and

smoke), etc. Livestock activities are affected by these activities as gates controlling livestock movement can be left open, water haul may be difficult due to shared vehicle use by all activities and /or lowered visibility during burning operations, livestock may be injured or killed by implementation equipment on roadways or in treatment units, livestock may pass through breaches in the fence line, and livestock use patterns may be altered by implementation activities. Although some impacts are expected during implementation, they are expected to be limited and few with no measurable impacts on grazing and would be limited to the time when treatments are being implemented.

Mitigation measures are specific actions that could be taken to minimize, avoid or eliminate impacts on resources that would be affected by the alternatives, or rectifying the impact by restoring the affected environment (40 CFR 1508.02). The following implementation guidelines are designed to avoid or minimize potentially adverse impacts to range improvements and range resources by controlling project implementation techniques (such as burn intensity) and controlling site-specific actions (site/improvement avoidance). If damage to range resources and/or improvements occurs, these guidelines identify a method to restore existing condition.

Where vegetation treatments require a period of rest from livestock grazing a precise treatment schedule needs to be developed and the exact period of rest needs to be specified by treatment unit. The individual treatment unit(s), with their associated period of rest, would need to be grouped by pasture and allotment to evaluate the effect on grazing operations on the affected pasture(s)/allotment(s). Any change in actual treatment dates would require a change or adjustment in livestock operations and may adversely affect the permittee. No periods of rest have been identified or requested under the Flank Project for treatments and there are no expected impacts.

Specific objectives for treatments need to be established and monitoring or evaluation techniques need to be established that reflect achievement so that grazing can resume when objectives have been met. This may simply be a set time such as particular number of seasons of rest. If large areas are treated at one time this may involve monitoring and evaluation after treatment at specified intervals to determine if objectives were met. No monitoring or evaluation techniques were requested or identified with the project for grazing and there are therefore no impacts.

Because some fuel treatment units planned under the Flank decision are large, overlap more than one pasture, or because multiple units may be treated within a year, or in successive years, an adaptive implementation plan would be developed that minimizes impact to the range permittee (PDC-1). This would be accomplished by managing treatment activities so that no more than one pasture of each of the affected allotment (up to two pastures in a given year) within the project area would require non-use by a single permittee during a given grazing season (PDC-4). Other alternatives such as permittee agreed non-use of more than one pasture in a given season, use of alternative pastures/allotments and deferred rotation may be used to meet treatment objectives.

Land management activities need to account for and protect range improvements including fences, water sets, and range study plots (Current Trend). Range improvements that need protection and/or require specific management actions and that are within or adjacent to selected treatment units are identified in the following pages and relate to Alternative 3. Protective actions that are specific to alternative 3 need to be incorporated into the project implementation plan, contract language, and the sale plan to be developed for the this alternative.

The treatment units listed in Tables 2 – 6 contain range improvements that need to be protected.

Other range improvements to manage for are existing cattle guards associated with road systems and fences. The concern is that during implementation activities roads may require grading or some other form of maintenance which could include snow removal. Operators of road equipment, in particular grader operators, need to be reminded that during maintenance activities, they need to avoid dragging surface materials such as dirt, cinders or gravel into or over cattleguard decks or grates that would cause them to “fill-up” and require additional work in the future (PDC-5). This has been an issue

in the past during harvest operations when inexperienced equipment operators are asked to perform road grading, a task they may be unfamiliar with.

Existing and established watering areas known as water sets, need to be excluded from project activities such as landings, prescribed fire, and slash piles. These water set locations are areas set aside for livestock operations and are intended to be used over and over again. Water set locations are perhaps the highest area of impact for livestock operations on dry upland allotments. Soil compaction from water trucks and livestock has been measured to significant levels to include up to 1 acre of disturbance. Livestock create a trail system to access the watering area and often lounge around after haven taken a drink. Due to such site disturbance and their attraction to vehicle use, water sets are optimum locations for the introduction of noxious weeds; although there are few locations where this has actually occurred on the Forest. For these reasons it is best if once established, that water set locations are not changed and their occurrence on the allotment is minimized.

3.8.5 Cumulative Effects – Range

Cumulative effects were analyzed at the project scale. This scale was chosen for effects analysis because similar conditions are present on the forest. Relevant past, present and reasonably foreseeable future actions that are listed in table 3.1 were considered. None of these projects would have an effect on range. Projects would not affect range because there would be no significant impact to allotment availability, fences, water sets, or forage. Project activities are consistent with Forest Plan Standards and Guidelines for range resources.

3.8 Recreation

3.8.1 Introduction

With the exception of Off Highway Vehicle (OHV) trail riding the majority of the project area receives light dispersed recreation use. Approximately 12 miles of the 318 mile East Fort Rock (EFR) OHV Trail system lies within the project area. Other dispersed recreation within the planning area includes such activities as dispersed camping, hunting, and driving for pleasure. Hunting is particularly heavy for deer and elk in the fall. Other than designated OHV trails the project area offers no developed recreation opportunities. The closest developed recreation facilities are the Camp II and Road 25 OHV Staging Areas to the south and east of the planning area.

3.8.2 Regulatory Framework

- Deschutes National Forest Land and Resource Management Plan (1990)
- Recreational Opportunity Spectrum (ROS), page 3-65
- Off Highway Vehicles, page 3-64
- Dispersed Recreation, page 3-53

3.8.3 Analysis Methods

Statistically valid use figures are unavailable since there are no fees charged, or any other methods used to track recreation use. It is estimated that over 30,000 OHV riders visit the EFR OHV area annually and based on observations by Forest Service staff, visitation continues to increase annually within the area. Exact trail locations for the maps of the Flank planning were identified by GPS tracks.

Dispersed campsites have not been inventoried for this project, though it's known that several dispersed camps exist within the planning area.

3.8.4 Existing Condition

OHV Trails

The EFR (EFR) OHV trail system lies on the east side of the Bend/Fort Rock Ranger District of the Deschutes National Forest providing 318 miles of trail for casual and competitive use covering about 110,000 acres and ranging in elevation from 4400 to 6400 feet. The trail system is designed for all

terrain vehicles (ATV) that are 50 inches wide or less and for motorcycles. Within the boundaries of EFR OHVs are allowed on designated routes and areas only. Non-street legal motorcycles and ATV's are only permitted to ride roads designated as “Shared Use”. Of the 318 miles of managed trails within EFR approximately 12 miles are located in part, or in their entirety, within the proposed Flank project boundary. This includes approximately 10 miles of designated trails and an additional 2 miles of shared use roads open to mixed motorized use.

The EFR trail system receives its greatest visitation numbers from nearby Central Oregon residents, as well as visitors from the Wouldamette valley and neighboring states of California and Washington. Visitation is highest during the spring and fall seasons and on weekends and holidays. Local visitation also occurs during the weekdays and usually peaks between the late afternoon and dusk hours because of short driving distances from Central Oregon population concentrations. The EFR OHV System is open year round and attracts a mix of visitors seeking varying challenge levels and overall experiences. Hot, dusty conditions normally inhibit riding from mid-July through September and cold, snowy conditions inhibit riding from mid-December through March.

Trail maintenance efforts have been, and continue to be, implemented with the purpose of providing a sustainable, motorized recreational opportunity within a forested setting. In addition to routine maintenance, the Forest Service encourages use of the managed OHV trail system through the availability of support facilities, signing, visitor contacts, and trail system maps.

EFR hosts several competitive and family orientated Special Use Events during the year. The China Hat International Six Day Enduro race, sponsored by LOBOS Motorcycle Club is held the last weekend of April and the Joker Poker Run sponsored by Central Oregon Motorcycle and ATV Club (COMAC) is held the first weekend of May annually. In addition the Motorcycle Riders Association’s (MRA) Fort Rock Enduro race and the LOBOS Fall Classic race are held annually the first 2 weekends of November.

Dispersed Recreation

Some dispersed camping occurs within the project area, especially in the fall during big game hunting seasons. Most dispersed sites are located off Forest roads in the interior of the planning area, although some occur along major travel routes. Use at some of these sites has resulted in sanitation problems, soil compaction, and a loss or degradation of vegetation. This is caused primarily by: user-created roads and trails, pit toilet development, use of vegetation for firewood and other camp use.

Driving for pleasure (sightseeing) does occur within the project area, primarily when roads are open and free of snow. Use fluctuates from very light on most dead end roads to moderate use on collector and local roads. Within the project area, collector and local roads receive increased use during the hunting season.

3.8.5 Direct and Indirect Effects – Recreation

Direct and Indirect Effects–Alternative 1

This alternative would continue current management practices and policies. Recreation opportunities would remain relatively unchanged No existing OHV trails or routes, facilities, structures, or infrastructure within the EFR OHV area would be impacted by vegetation or fuel reduction activities. There would be no need to close roads or trails to use during periods of management activities.

No actions are proposed to close, restrict, relocate, or rehabilitate roads within the project area under this alternative. Existing campsites and roads (including user-created) would continue to be utilized and/or developed. Impacts are generally in the form of trampled vegetation, sprawling campsites and roads, and compacted soils that likely contribute to seasonal overland flow in concentrated recreation sites/areas.

Direct and Indirect Effects– Alternatives 2 and 3

This alternative proposes vegetation treatments (thinning, salvage operations, mowing and burning) within and adjacent to designated OHV routes within the boundaries of the EFR OHV area. Direct impacts to the Trail System as a result of proposed treatment activities include a temporary loss of

available trail mileage managed for ATVs and motorcycles. This could also result in an increased use of other OHV trails that are part of the managed OHV System but outside of the proposed project boundary. The increase in traffic on these trails may lead to an escalated trail maintenance workload to sustain the trails for continued use. The temporal span during which direct impacts would be realized would vary. Winter and spring operations would result in the highest impact on the rider because access to much of the southern portion of EFR (outside the Flank Planning Area boundary) during that time of year is blocked by snow.

Removal of vegetation or other natural forest debris during implementation of proposed vegetation and fuel treatments could result in some increase of unauthorized use such as traveling off designated routes. This risk would be minimized by implementing the design criteria that retains existing vegetation and forest debris or replace vegetation and/or debris with suitable native materials upon completion of management activities.

None of the roads within the EFR boundary proposed for closure or decommissioning under either alternative are designated routes or trails open to OHV use. There would be no change in the number of miles of shared use roads open to non street legal vehicles under either alternative.

Vegetation treatments would likely have a short-term (3 to 10 years) effect to the visual quality of the treatment areas adjacent to dispersed campsites. Visitors would see treatment areas along travel routes as they pass through to reach this and other destinations, and from their campsites. This is especially true along more traveled roads where a variety of vegetation treatments are proposed. Slash piles would be burned when optimal burning conditions arise. Post-burn visual conditions could include tree scorch and evidence of burning of shrubs. Shrub mowing would be evidenced until the shrubs regain height and vigor. The combination of mowing and prescribed burning for maintenance would likely provide most of the same effects, likely with less scorch to trees.

In total there is approximately 8 miles of roads proposed to be closed to motor vehicle use in these action alternatives. These closures would minimally reduce driving opportunities for access to dispersed sites, sightseeing and other activities. Most road closures are roads that are not heavily used or are not necessary for regular administrative use. Most dispersed campsites within the planning area would not be impacted. Those campers and other recreationists that frequent the affected sites on a regular basis (i.e. at least one visit per year) would likely be inconvenienced. For motor vehicle campers displaced from specific sites, it is likely they would take one of the following actions:

- Utilize campsites that remain accessible.
- Develop new sites and access roads in other areas.
- Breach road closures to access campsites.
- Camp and recreate at another location other than this area.

3.8.5 Cumulative Effects – Recreation

The analysis scale used to determine recreational cumulative effects was limited to the Flank project area. This analysis scale was based on the minimal impacts to recreation within and adjacent to the project area in relation to those activities listed in table 3.1. There are no cumulative effects to OHV use or dispersed recreation within this area based on any past, present and reasonable foreseeable future actions including the Flank project. The Flank Project would meet the Standard and Guidelines identified for dispersed recreation and motorized trails in the Deschutes National Forest Land and Resource Management Plan (1990).

3.9 Road Engineering

3.9.1 Travel Analysis

To reduce habitat fragmentation and mitigate both the reduction of hiding cover and the low levels of thermal cover, approximately 6.3 miles of existing system roads would be either closed or decommissioned (figure 3.9.1). About 4 miles of road would be closed. Closed roads are not needed for current management, but are expected to be needed for future management activities. Closed roads could be used for administrative purposes (permit administration, fire suppression, etc.) or by permittees under permit such as for grazing.

About 3.6 miles of system road have been analyzed and identified as excess and no longer necessary for management of this land base. Decommissioning removes the road from the Forest inventory system and in most cases obliterates the existing roadbed using various techniques to aid in the quick recovery of the disturbed area to a productive condition. Table 3.9.1 identifies analyzed roads for decommissioning. These roads would be obliterated when all activities for this area are completed and as opportunities become available. All of the 3.6 miles of road slated for decommissioning would be subsoiled.

Table 3.9.1 Draft and Final Road Analysis for Flank Project Area

Road #	Operational Maintenance Level	Draft Miles	Final Mileage	Final Proposal
1800000	3 - SUITABLE FOR PASSENGER CARS	1.60	0.80	Maintain at Current Level
1825000	2 - HIGH CLEARANCE VEHICLES	0.59	0.85	Maintain at Current Level
1830000	2 - HIGH CLEARANCE VEHICLES	1.90	1.90	Maintain at Current Level
1800525	2 - HIGH CLEARANCE VEHICLES	1.90	1.90	Maintain at Current Level
1800527	2 - HIGH CLEARANCE VEHICLES	1.70	0.30	Maintain at Current Level
1825400	2 - HIGH CLEARANCE VEHICLES	1.32	1.32	Maintain at Current Level
1825430	2 - HIGH CLEARANCE VEHICLES	0.30		Decommission
1825450	2 - HIGH CLEARANCE VEHICLES	1.60	0.66	Maintain at Current Level
1825451	2 - HIGH CLEARANCE VEHICLES	0.30	0.30	Maintain at Current Level
1825457	2 - HIGH CLEARANCE VEHICLES	1.20		Close
1825710	2 - HIGH CLEARANCE VEHICLES	0.60	0.15	Maintain at Current Level
1825730	2 - HIGH CLEARANCE VEHICLES	1.00	1.00	Maintain at Current Level
1825750	2 - HIGH CLEARANCE VEHICLES	2.00	2.00	Maintain at Current Level
1825760	2 - HIGH CLEARANCE VEHICLES	1.10		Close
1825790	2 - HIGH CLEARANCE VEHICLES	0.30	0.30	Maintain at Current Level
1825800	2 - HIGH CLEARANCE VEHICLES	1.80	1.80	Maintain at Current Level
1825810	2 - HIGH CLEARANCE VEHICLES	0.70	0.70	Maintain at Current Level
1825860	2 - HIGH CLEARANCE VEHICLES	1.00	1.00	Maintain at Current Level
1825870	2 - HIGH CLEARANCE VEHICLES	0.30	0.30	Maintain at Current Level
1825900	2 - HIGH CLEARANCE VEHICLES	0.24	0.24	Maintain at Current Level
1825900	2 - HIGH CLEARANCE VEHICLES	1.56	2.08	Maintain at Current Level
1825915	2 - HIGH CLEARANCE VEHICLES	0.22	0.22	Maintain at Current Level
1825920	2 - HIGH CLEARANCE VEHICLES	1.40		Decommission
1825930	2 - HIGH CLEARANCE VEHICLES	1.30	1.30	Maintain at Current Level
1825933	2 - HIGH CLEARANCE VEHICLES	0.40	0.40	Maintain at Current Level
1825940	2 - HIGH CLEARANCE VEHICLES	0.70	0.70	Maintain at Current Level
1825960	2 - HIGH CLEARANCE VEHICLES	1.00		Decommission
1825963	2 - HIGH CLEARANCE VEHICLES	0.20		Decommission
1825967	2 - HIGH CLEARANCE VEHICLES	0.70		Decommission

Road #	Operational Maintenance Level	Draft Miles	Final Mileage	Final Proposal
1825970	2 - HIGH CLEARANCE VEHICLES	0.20	0.20	Maintain at Current Level
1830010	2 - HIGH CLEARANCE VEHICLES	0.50	0.50	Maintain at Current Level
1800511	1 - BASIC CUSTODIAL CARE (CLOSED)	0.20		Decommission
1825880	1 - BASIC CUSTODIAL CARE (CLOSED)	0.00		Decommission
1825926	1 - BASIC CUSTODIAL CARE (CLOSED)	0.20		Decommission
1825945	1 - BASIC CUSTODIAL CARE (CLOSED)	0.90		Close
	Total System Miles	29.64	20.92	Post Analysis Open Road Miles

Pre Travel Analysis		Post Travel Analysis	
Current Open Road Miles	26.30	20.92	Current Open Road Miles
Current Closed Roads	1.30	2.3	Identified for Closure
Sq miles	8.89	4.0	Identified for Decommissioning
Miles Road/Sq Mile	2.96	1.54	Miles Road/Sq Mile

3.9.2 Regulatory Framework

- FSM (Forest Service Manual) 7733
- Forest Wide Roads Analysis

3.9.3 Project Area Access

Flank is located in the middle of the eastside of BFR District, access to this project areas road system, one must travel over significant portions of FS-HSA Road, County and State Highways (Table 3.9.2, other agency roads not included in table). Those roads include FS road 18, 25 and Deschutes County portions of 18, 23, 25 and State Highways 20 and 97.

Table 3.9.2 Arterial Access to Flank Planning Area

Road	Mtc. Level	Termini				Total Miles	Jurisdiction
		From	Mile	To	Mile		
18	5	Hwy 97	0.00	FS Boundary	1.82	1.82	Deschutes County
	5	FS Boundary	1.82	End of Pavement	9.02	7.20	Forest Service
	4	End of Pavement	9.02	FS Road 1825	15.43	6.41	Forest Service
	3	1825 North	15.43	1825 South	19.15	3.72	Forest Service
	3	1825 South	19.15	FS Road 25	23.82	4.67	Forest Service
23	5	Hwy 20	0.00	FS Road 25	5.82	5.82	Deschutes County
25	5	County 23	0.00	FS Boundary	0.75	0.75	Deschutes County
	3	FS Boundary	0.75	FS Road 18	4.74	3.99	Forest Service

3.9.3 Deferred Arterial Road Maintenance

There are two categories of maintenance needs that arise as a result of the vegetation management planning process. The first category, deferred maintenance, consists of maintenance needs that are pressing but not necessarily essential for timber hauling as part of the Flank Vegetation management project. The second category of maintenance needs include those items that need attention prior to timber haul, without which; the Forest Service would not be able to implement project activities.

Table 3.9.3 shows the first category of maintenance needs, those present but not necessarily essential for timber haul. These roads may be used to support the activities of this project. Included in this table are road deficiencies that given the opportunity should be address. The activities purposed in this document would not generate enough resources to contribute to these costly maintenance activities. Currently other opportunities are being researched to meet these needs.

Table 3.9.3 Deferred Maintenance (arterial, collector, and local roads)

Road	Termini				Total Miles	Maintenance and Reconstruction Activities
	From	Mile	To	Mile		
18	FS Bdry	1.82	End of Pavement	9.02	7.20	Single lift Chipseal
18	FS Bdry	9.02	FS Road 1825 N.	15.43	6.41	Insufficient Surfacing. Add 6” compacted 1” minus dense graded aggregate.
18	FS Road 1825 N.	15.43	FS Road 1825 S.	19.15	3.72	Blade and Shape
18	FS Road 1825 S.	21.65	FS Road 1830	23.79	2.14	Insufficient Surfacing. Add 6" compacted 1" minus dense graded aggregate.
2015	FS Bdry	6.67	FS road 18	7.26	0.59	Insufficient Surfacing. Add 6" compacted 1" minus dense graded aggregate. Brush, Restore Drainage

3.9.4 Road Maintenance and Reconstruction Needed for Haul

Arterial Road Maintenance

There is a small amount of arterial access adjacent and within this planning area that is deficient in surfacing to support proposed work and is recommend to be resurfaced providing that the resources generated by this project support can fully fund this maintenance activity. With the instability of the current timber markets and operating expenses, the purposed road work may have to be mitigated by other alternatives. Again these can be achieved through various efforts such as limiting the season of haul, over frozen or snow covered conditions, etc (see table 3.9.3).

Stabilizing the road surfacing is one alternative which reduces the amount of annual maintenance, needed to keep these roads maintained to standard. Another benefit of stabilization is the reduction of dust particles in the air and improves the safe operation of the road by increasing roadway visibility. Stabilization can be achieved by several methods. Methods for consideration are, blending bentonite clay with aggregate, blending chlorides with aggregate or placing a 2-lift BST (Bituminous Surface Treatment).

Table 3.9.4 Arterial Road Work Needed to Support Haul

Road	Termini				Total Miles	Maintenance and Reconstruction Activities
	From	Mile	To	Mile		
18	FS Road 1825	19.15	M.P. 21.65	21.65	2.5	Insufficient Surfacing. Add 6" compacted 1" minus dense graded aggregate.

Collector Road Maintenance

In this project there are 6.33 miles of Forest Service Collector Roads (Table 3.9.5). These roads were also analyzed in the Forest Wide Roads Analysis. The condition of the Collector road system has diminished significantly over the past several years. Aggregate or Cinder type surfacing on these roads are worn-out, becoming un-maintainable and need to be resurfaced.

Since these roads do not receive the same attention as the HSA roads the need and degree of general maintenance to accommodate use is more extensive. This prescribed work not only needs to meets the objectives for this project but also to meet the long term goal of leaving these roads in a condition to self maintain themselves for the future. All of these roads would be in need of more routine maintenance. Road work related maintenance items along these routes would- consist of; roadside brushing, ditch cleaning, reclaiming of clearing limits for site distance, felling of danger trees along traveled routes bordering and within this project boundary. Danger tree reduction would be in accordance to FSM (Forest Service Manual) 7733 and Region 6 Danger Tree Policy.

Table 3.9.5 Collector Road Work Needed to Support Haul

Road	Termini				Total Miles	Maintenance and Reconstruction Activities
	From	Mile	To	Mile		
1825	FS Rd 1825400	4.53	FS Rd 1825450	4.95	0.43	Grade,Clean/Restore Drainage, Spot Surface
1825	M.P. 7.72	7.72	FS Road 18	11.62	3.90	Grade,Clean/Restore Drainage, Spot Surface (4.6-5.0, 10.6-11.0)
1830	FS Rd 1825400	0.00	FS Rd 1830200	2.00	2.00	Grade,Clean/Restore Drainage, Spot Surface

3.9.5 Local Road Maintenance and Reconstruction Needed for Haul

Local roads in general are routes that are mostly native surfaced and receive very limited maintenance. Within this project there are 25.94 miles of open road. These roads would receive a very limited amount of additional work to support this project. Maintenance items would consist of that necessary to sustain this road during the life of the project. Such items may consist of blading, brushing and spot surfacing to protect roadways. As this project nears post haul activity it is highly recommended that these roads receive adequate amount of maintenance to achieve a self-maintaining state. Construction and restoration of drainage and drainage structures (rolling dips, waterbars and leadouts) are critical elements to achieve the desired effect. Other associated maintenance on these road types would include limited brushing, pre and post haul blade and shaping of roadway.

3.9.6 Cumulative Effects

Road system effects were analyzed at the project area scale. This scale was chosen because transportation systems are affected locally by decommissioning and closure. Past, present and reasonably for foreseeable future activities listed in table 3.1 were analyzed. The only activity that may affect the road system is the new Travel Management Rule and Motor Vehicle Use Map (MVUM). This map and the associated rules would make enforcement of road closures and off-road prohibitions more straightforward. When combined with the decommissioning planned in Flank these activities would result in a reduction in user created roads, and elimination of system roads that are no longer needed for management purposes. The overall effect would be a reduction in the number of roads (both user created, and system roads) in the area. Effects would not significantly affect the transportation system or limit user access.

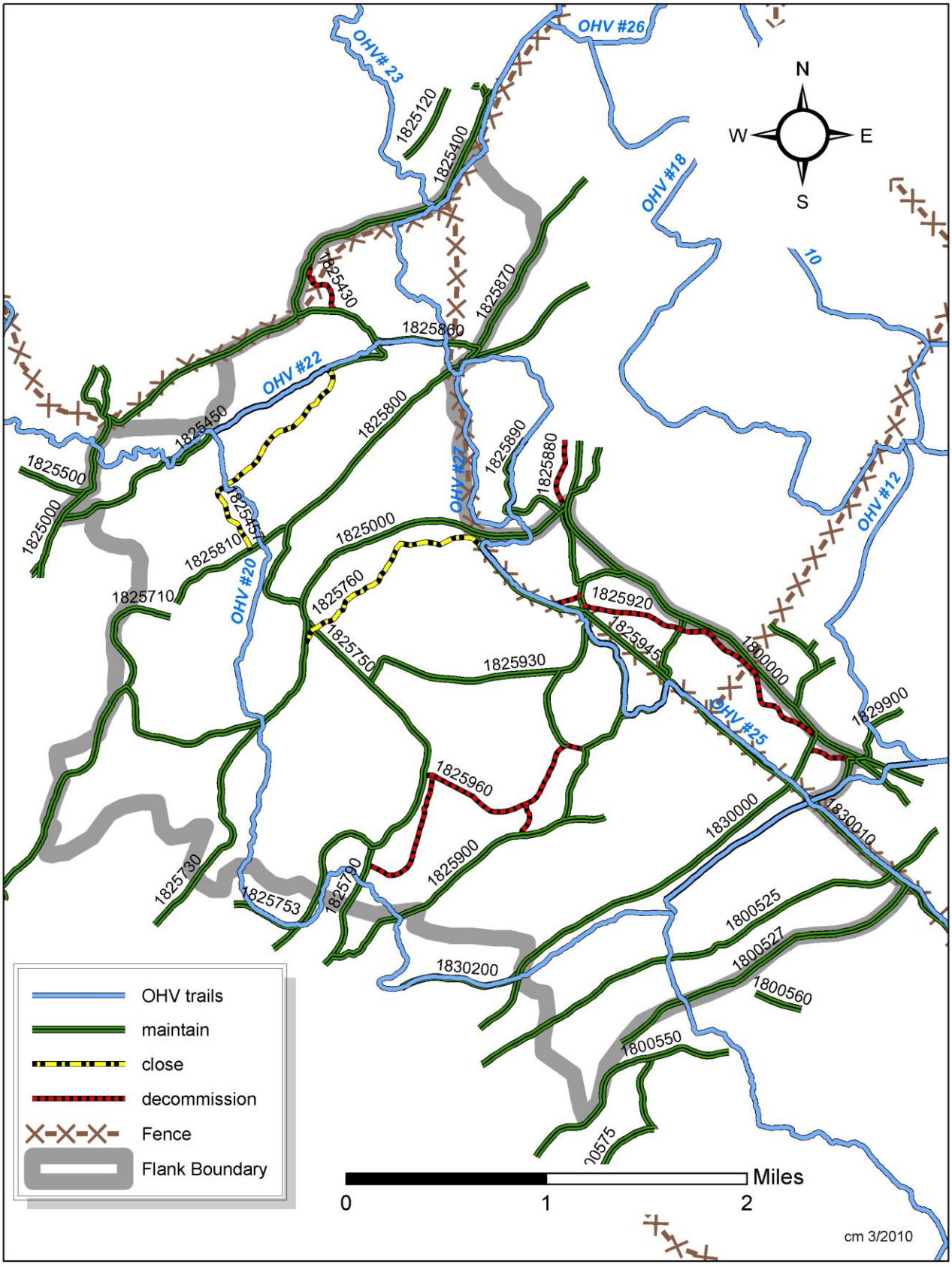

Figure 3.9.1 Road closure and decommissioning associated with the project

410 & 928 roads have been closed to level 1 and are not shown on this map.

3.11 Heritage Resources

3.11.1 Regulatory Framework

- Deschutes National Forest Resource Management Plan CR-2, CR-3, CR-4
- Forest Service Manual section 2360
- Federal Regulations 36CFR64 and 36CFR800 (amended December 2000)
- National Historic Preservation Act (NHPA) of 1966 (as amended)
- National Environmental Policy Act
- National Forest Management Act

3.11.2 Analysis Methods

Portions of the project area were surveyed for heritage resources prior to initiation of the current environmental analysis. Additional pedestrian surface surveys for the proposed Flank Vegetation Management Project occurred in the fall of 2009 and were conducted by the District Archaeologist, archeology staff, and occasionally, one volunteer. Pedestrian transects spaced at 15 to 20 meters were surveyed over areas of high and moderate sensitivity for locating heritage resources. A number of factors were used to determine the probability zones including: location and size of the treatment units, slope, vegetation, ground visibility, and possible presence of prehistoric/historic travel corridors. "Boot scrapes" were employed at frequent intervals (approximately every 30 meters) to remove thick surface layers of ponderosa pine needle duff.

Background research, historic literature reviews, and archaeological survey of the Flank Vegetation Management Project were conducted in order to comply with the laws and regulations cited above. Prior to the field investigation, the District/Forest Master Survey Map(s) (MSM), references in the District cultural resources library, and Historic Inventory Maps(s) (HIM), were reviewed in order to identify and evaluate prior archaeological surveys, known cultural resources, and area sensitivities. The Deschutes County Historical Society's extensive historic database was also consulted.

3.11.3 Desired Future Condition

The desired condition is not clearly stated in the Forest Plan but can be derived from the implied goals of the Standards and Guides and the Monitoring Plan. Ideally, it would be desirable to know the location and extent of all heritage resources and to have each one evaluated for eligibility to the National Register of Historic Places. In addition, it would be appropriate to have developed management plans for all eligible properties that would provide protection or mitigate effects that could occur to heritage resources, particularly such historic transportation corridors as the historic railroad logging systems from the first half of the 20th century.

3.11.4 Existing Condition – Heritage Sites

Eleven previously identified and new heritage resource sites have been documented. None of the heritage sites have been evaluated for eligibility to the National Register of Historic Places. There are four prehistoric sites that represent open-air lithic scatters, four historic sites that represent both railroad logging and settlement, and two sites that have components from both time periods. Prehistoric artifact scatters, and historic sites associated with early railroad logging operations, are the most common site types found on a wide variety of landforms. Prehistoric sites are found both on the modern ground surface and deeply buried by ash and pumice from volcanic activity.

The great majority of archaeological sites in the Flank area are composed of stone artifacts and waste material produced during lithic reduction and the production of chipped stone. Obsidian flows at McKay Butte, Quartz Mountain, and Newberry Crater are well-known sources of obsidian raw material and they can be identified as the source for many of the flaked stone artifacts in Central Oregon (McFarland 1989). Given the dispersed nature of the resource base, such [archaeological] sites are likely to be small and dispersed over the landscape. They may exist even in unsuspected places, such as near lava tube caves in Central Oregon that could have been both sources of water and natural "refrigerators" for storing fresh meat. Emphasis on storable foods appears to be the best explanation for the dramatic increase, between 8,000 and 5,000 years ago, in use of areas where seasonal scarcity apparently prevented substantial use during the period between 10,000-8,000 years ago (Lebow et. al. 1990). Presently, a series of railroad grades and historic sites exist across the planning area.

Figure 3.11.1 Big Obsidian Flow at Newberry Crater

3.11.5 Direct and Indirect Effects

Direct and Indirect Effects – Alternative 1

Implementation of the no action alternative would not directly or indirectly affect heritage resources since there would be no activity causing change to the integrity or setting of heritage resource sites. No treatments of any sort related to the Flank project would occur under this alternative. There would be no change in current management direction or in the level of ongoing management activities.

Indirect effects would derive from unmanaged fuels consumed during a wildfire event. By not treating the fuels, burn temperatures are likely to be extreme, thus potentially endangering unknown cultural resource sites and artifacts.

Obscuring vegetation does lend a certain level of protection to otherwise high visibility objects on the ground surface. In the event of a large wildfire, much of this vegetation would be removed by burning or during suppression activities such as fire line construction. Higher visibility of sensitive materials at cultural resource sites would then be more vulnerable to looting and theft, an on-going problem on public lands in Central Oregon.

The loss of surface litter from intense wildfire combined with increased hydrophobic soil conditions leads to erosion due to runoff of surface water. Erosion across sites removes artifacts and deposits sediment from uphill slopes.

Direct and Indirect Effects – Alternative 2

Since appropriate and approved surveys and cultural site protection measures are already in place for this project any potential direct and indirect effects would be in the form of inadvertent damage to the integrity of cultural resources which were not discovered during initial survey.

In locations of project activities using heavy equipment, direct effects on cultural resource sites would be mitigated by the project design criteria of buffering site boundaries and avoiding all direct or indirect activity within the sites. This covers all grapple piling and harvest including cable yarding, temporary road building and subsoiling, and creation of skid roads and landings. Site boundaries with an appropriate buffer (typically 30 meters) would be identified and flagged by project archeologists, their on ground locations would be provided to the project manager, and sites would be avoided by project activities. There would be no direct effects on these sites if these protection measures are appropriately implemented.

Burn piles would not be placed within site boundaries, eliminating the direct effect of extreme heat on sites and artifacts. Due to the low number of heritage resources sites identified within project boundaries, all sites would be easily avoided by fuel implementation activities.

In units identified for mechanical brush treatment (mowing), the equipment would avoid known heritage site boundaries, eliminating the impacts from turning the equipment around.

Undiscovered and unrecorded heritage resources that are identified during project implementation would be protected until they are evaluated by the Bend-Fort Rock District Archeologist. As per contract /USFS in-house specifications, all treatment activities would cease in the vicinity of such a discovery until the archeologist completes the appropriate site assessment.

Inadvertent discovery of new heritage resource site(s) during project implementation could result in site destruction or damage creating a direct effect because the site was not identified in advance. An example of this would be a small site that had previously only been identified as an isolated find due to a limited number of artifacts (less than 10 items) observed at the time of initial discovery. After the surface duff and soil removal, a large number of artifacts could be uncovered resulting in theft and destruction. Often, by the time that such a site is discovered, some physical damage has already occurred, since increased visibility through mechanical disturbances lead to discovery. Regarding the cases of inadvertent site discovery, USFS timber contract specifications would require that the activities cease in the area of the site, protecting the surface integrity of the heritage artifacts or features, until it can be evaluated by the District Archaeologist.

Direct & Indirect Effects – Alternative 3

There would be no direct and indirect effects to known heritage sites because of activities described in alternative 3. Project design critiera would be the same under alternative 3 as those described n alternative 2.

Potential effects to as yet undiscovered sites may occur as a result of heavy equipment for harvest and grapple piling, possible fire line construction by hand, pile burning, turns made by the brush mower, road work outside established road prisms, temporary road development, and danger tree felling are the same. This alternative would also allow for biomass removal, the use of heavy machinery may have an effect on as yet undiscovered sites.

3.11.6 Cumulative Effects

Cumulative effects to heritage resources were analyzed at the project area scale. This scale was chosen because heritage resources are site specific and any impacts to sites would be local. Activities listed in table 3.1 were analyzed for potential cumulative effects. No cumulative effects are anticipated to occur to these cultural sites from any of the proposed actions under the Flank project since appropriate and approved surveys and cultural site protection measures are already in place for this project (see Design Criteria Chapter 2). All Forest Plan Standards and Guidelines would be met with this project.

3.11 Economics

3.11.1 Introduction

This section deals with three aspects of economic and social impacts: economic viability, impacts to the local economy/employment, and environmental justice. Economic viability is dependent on costs and revenues associated with a particular timber sale. Impacts to the local economy are a reflection of District and Forest harvest levels and employment. Timber sales, fuel treatments, and associated resource work can generate employment and stimulate the local *economy*. Environmental justice can also be a concern if minorities are not granted equal opportunities to benefit from government programs and projects.

Civil Rights legislation and Executive Order 12898 (Environmental Justice) direct an analysis of the proposed alternatives as they relate to specific subsets of the American population. The subsets of the general population include ethnic minorities, people with disabilities, the elderly, and low-income groups. Environmental Justice is defined as the pursuit of equal justice and protection under the law for all environmental statutes and regulations, without discrimination based on race, ethnicity, or socioeconomic status. The minority and low income populations groups living in counties surrounding the project area work in diverse occupations. Some minorities, low income residents, and Native Americans may rely on forest products or related forest activities for their livelihood. This is especially true for those individuals that most likely reside in the rural communities adjacent to National Forest Lands, such as La Pine, Crescent, and Gilchrist, Oregon.

The no action alternative would continue the local economic situation as described in the section titled Economics. Opportunities for employment of minority and low income workers may arise through contract activities for various forest work, such as thinning, hand piling, and various small business contracts related to work outside the project area, but there are no known disproportionately high effects to any ethnic minorities, people with disabilities, and low-income groups.

Under both action alternatives there would be no known adverse effects that would be disproportionately high to any ethnic minorities, people with disabilities, and low-income groups as a result of implementation of either action alternative in the Flank project.

Table 3.11.1 Comparison of Activities by Alternative

Activity	Alt 1	Alt 2 (acres)	Alt 3 (acres)
Commercial Thin	0	5,341	5,268
Fuels Reduction	0	5,549	5,476
Machine Shrub Treatment	0	266	266
Ladder Fuel Reduction	0	149	149
Piling -hand	0	5	5
Piling -grapple	0	1,345	1,272
Lop & Scatter	0	1,131	1,131
Prescriptive Burning	0	4,902	4,705
Precommercial Thinning		2,513	2,440
Sub Soiling	0	350	345
Reforestation Surveys	0	76	76
Road Management	**(miles)**	**(miles)**	**(miles)**
Temporary Road Construction	0	12.5	12.5
Road Closure	0	4	4
Road Decommissioning	0	2.3	2.3
Road Maintenance	0	36	36

Ladder fuel reduction and pre-commercial thinning are the same activity on the ground – thinning small trees. Ladder fuel reduction is used for the express purpose of reducing ladder fuels and improving fuel bed structure and loading to reduce the effect of wildfires. Pre-commercial thinning is used for silvicultural purposes to manage the next crop of trees on a site

3.11.2 Regulatory Framework

- Forest Service Handbooks 1909.17 and 2409.18
- Executive Order12898 (February 11, 1994) on Environmental Justice

3.11.3 Analysis Methods

A comparison of the alternatives was completed for the Flank Project area on the Bend/Fort Rock Ranger District. The Transaction Evidence Appraisal (TEA) method with the most recent product log values and TEA appraisal costs were used for evaluation.

It is important to note that the economic analysis presented here is a best estimate of costs. Actual appraised value may change over time and depend on how one or more sales is packaged out of this environmental assessment. It may be possible to produce one or more viable sales out of an EA that appears, as a whole to be non-viable.

The harvest volumes and species mix are estimates from the silvicultural prescriptions. Timber values were calculated using the current Product Quality Adjustment (PQA) for delivered logs, in western Oregon saw mills. Stump to truck logging costs for ground based logging were estimated at $150/mbf. Brush disposal costs were set at $ 6.64/mbf and haul costs were set at $46.00/mbf. Road maintenance and reconstruction costs were based on the

logging systems analysis for the sale. Road maintenance costs were set at $18.75/mbf. A complete list of costs used is displayed in table 3.11.2.
Economic Efficiency identifies all the monetary costs and benefits associated with the Flank Project and identifies a Net present value and cost benefit ratio for the project. A 4% discount rate is used to value all costs and benefits to present value.

The economic analysis of the project which compares economic features such as Present Net Benefits, Present Net Costs, Present Net Value and Benefit cost ratios was calculated using econ52.xls which is an economic analysis tool developed by Steve Rheinberger available at http://www.fs.fed.us/r6/nr/fp /FPWebPage/FP70104A/Programs.htm. The program allows evaluation of timber sale economics based on current and or future sale data. The spreadsheet uses the Transaction Evidence Appraisal system to generate basic timber values and estimated advertised rates. To assess economic efficiency of Alternatives 2 and 3, the anticipated timber volumes and costs were entered into TEA.ECON, The analysis can be used to compare alternatives, not to give an absolute number for the outputs. Numbers useful for comparing alternatives include a benefit/cost ratio, discounted benefits, discounted costs, and present net value.

This analysis does not place a value on indirect benefits which may occur (such as increased future yields resulting from reduced stocking and reduced risk of stand replacing wildfire). Other amenity values, such as dispersed recreation or wildlife habitat, values were not developed. Costs incurred by the Forest Service to plan and implement the timber sale and costs expected to be incurred by the purchaser of the commercial portions of this project are included in the costs for logging.

Table 3.11.2 Forest Service and Purchaser Timber Credits

Activity	$/mbf
Planning NEPA	6.60
Sale Preparation	10.36
Sale Administration	8.05
Stump to Truck	150.00
Log Haul	46.00
Road Maintenance	18.75
Brush Disposal	6.64
Temp Road Decommission	3.07

Analysis Methods –Non-Logging Costs

Additional costs of activities which with the timber sale are intended to meet the resource objectives of the project. These are considered non-timber costs since they are not part of the logging but are more tied to the desire to manage stands and fuels to levels which meet resource objectives. These include:

- Fuels Treatments which would reduce the potential fuels loadings to levels where prescribed fire and natural fire processes can develop. These include:
  - Grapple piling and burning (on ground-based harvest units) with machinery along skid trails.
  - Hand piling and burning of slash in treated units.
  - Mechanical Shrub treatment of brush and surface fuels with mowing type machinery.
  - Ladder Fuels Reduction LFR cutting of small diameter trees.
  - Lop and scatter of LFR or precommercial thinned trees.
  - Under burning of natural and created surface fuels.
- Subsoiling of landings, temporary roads, main skid trails and road decommissioning in units and roads designated to reduce detrimental soil conditions and increase soil productivity

- Reforestation monitoring of overstory removal treatments to ensure prescription meets reforestation standards.
- Precommercial thinning of plantations and understory trees in harvest units.
- Road closure and decommissioning of roads not needed following activities.

The following table identifies the costs used which include overhead assessments. These are non-timber projects and activities:

Table 3.11.3 Non-Logging Treatment Costs

Activity	$/acre
Fuels Treatments	
Grapple Piling	317
Hand Piling	552
Lop & Scatter	92
Whip Falling	199
Ladder Fuel Reduction	199
Machine Shrub Treatment	166
Underburning	479
Precommercial Thinning	178
Road Closure	500 (each)
Sub soiling	210
Reforestation surveys	21

Analysis Methods –Jobs From Forest Products

Jobs from forest projects is calculated from the volume harvested on the Deschutes National Forest, an estimated 9.6 jobs per million board feet were maintained or created Income from jobs from forest products is derived by multiplying the number of jobs maintained or created by $31,811, the average 1999 salary in Central Oregon for lumber and wood products jobs. Source of salary information: Oregon Covered Employment & Payrolls by County and Industry, Oregon Employment Department, and US Bureau of Labor Statistics.

3.11.4 Direct and Indirect Effects – Forest Products

Over the last 10 years, an annual average of approximately 68.2 MMBF of timber has been sold from the Deschutes National Forest. In the near future, the amount of timber offered for sale is expected to be near this annual average. The Deschutes National Forest is expected to continue offering timber for sale and is expected to continue making contributions to the local economy as a result of timber harvest activities.

The Bend/Fort Rock Ranger District provides timber and non-timber forest products to the local community and state. The Forest products include timber, firewood, vegetative material and more. The Flank project plans to provide timber and possibly biomass. The timber offered from this project would be included in the Deschutes National Forest offer. Biomass produced from the tops and purchasers could remove less than merchantable material if a market exists. Biomass was not included as a commodity since it is considered slash and not a saleable product.

Direct and Indirect Effects– Forest Products –Alternative 1

Alternative 1 would not contribute to the volume of timber sold on the Deschutes National Forest.

Direct and Indirect Effects– Forest Products –Alternative 2

Alternative 2 would produce 14.5 million board feet of timber. The volume is estimated to be 7.7 million board feet of ponderosa pine and 2.4 million board feet of lodgepole pine saw timber and at least 4.3 million board feet of volume which is non-sawtimber. This volume is about 21 percent of the annual forest timber offered.

Direct and Indirect Effects– Forest Products –Alternative 3

Alternative 3 would produce 14.2 million board feet of timber. The volume is estimated to be 7.6 million board feet of ponderosa pine and 2.3 million board feet of lodgepole pine and about 4.3 million board feet of volume which is non-sawtimber. This volume is less than 21 percent of the average annual forest timber offered.

3.11.5 Direct and Indirect Effects – Economic Efficiency

Economic efficiency is the project as a whole and the costs and benefits displayed as Net Present Value (NPV). Logging costs and road related costs often affect the efficiency of a timber sale. Road costs and haul costs are analyzed for the timber sale along with the stump to truck costs to extract the timber and costs to dispose of logging slash. Road maintenance is required to maintain the forest service roads in a condition where other users would be able to use them and to protect the roads as a resource. Forest Service costs to prepare and implement the timber sale are calculated as the related project. Other costs not associated with the timber sale are part of the project as a whole and can be funded through other sources than the timber sale.

Direct and Indirect Effects – Economic Efficiency – Alternative 1

Alternative 1 would not conduct any of the projects proposed though the money for planning would have been spent if the project does not get implemented. This means the Forest Service is in the hole no matter what.

Direct and Indirect Effects – Economic Efficiency – Alternative 2

Alternative 2 has positive cash flow for the timber sale alone. The timber sale would be worth more than the minimum bid price and would therefore probably sell. The Forest Service would not recoup the planning and implementation costs estimated at $244,000. The net present value of the whole project is over $3,000,000. This project focus would benefit other resources more than produce revenues.

Direct and Indirect Effects – Economic Efficiency – Alternative 3

Similar to alternative 2, alternative 3 has positive cash flow for the timber sale alone. The timber sale would be worth more than the minimum bid price and would therefore probably sell. The Forest Service would not recoup the planning and implementation costs estimated at $242,000. The net present value of the whole project is just under $3,000,000. This cost reduction is mostly because of reduced costs of not conducting fuels treatments in stand 54. This project focus would benefit other resources more than produce revenues.

3.11.6 Direct and Indirect Effects – Employment

Although the past decade has seen a significant reduction in employment within the lumber and wood products industry the lumber and wood products industry is still an important contributor to the local economies. In 1999 in Crook County 1,510 people were employed in the lumber and wood products industry and in Deschutes County 4,770 people.

Direct and Indirect Effects – Employment– Alternative 1

No maintenance or increase in employment is imputed with this alternative though sport falling and sport dumping as developed on the Bend/ Fort Rock district would continue.

Direct and Indirect Effects – Employment– Alternative 2

Alternative 2 with close to 14.5 million board feet of timber removed would provide material enough to maintain or create 139 timber industry jobs.

Direct and Indirect Effects – Employment– Alternative 3

Alternative 3 with close to 14.2 million board feet of timber removed would provide material enough to maintain or create 136 timber industry jobs. This is less than Alternative 3 due to the decrease in units with timber removal.

Table 3.11.4 Summary of Forest Products Economic Efficiency Analysis

Economic Measure	Alt 1	Alt 2	Alt 3
Benefits			
Acres of Commercial Harvest (gross acres)	0	5,341	5,268
Saw Timber (MBF)	0	14.5	14.2
Discounted Benefits[1]	0	93,794	89,621
Discounted Timber Sale Costs	0	(337,912)	(332,085)
Sale Area Projects			
Subsoiling	0	5,040	5040
Pre-commercial thinning	0	447,314	434,320
Road Decommissioning	0	0	4,350
Road Closure	0	0	8,000
Fuels Treatments			
Underburning	0	2,348,058	2,253,695
Lop & Scatter	0	104,052	104,052
Mechanical Shrub Treatment	0	44,156	44,156
Ladder Fuel Reduction	0	29,651	29,651
Hand piling	0	2,760	2,760
Grapple piling	0	426,365	403,224
Sale area Improvement and Discounted Fuels Costs		(2,783,375)	(2,687,612)
Total Discounted Costs[1]	(100,000)	3,121,287	3,019,617
Summary			
Benefit/Cost Ratio[1] without fuels treatments		0.28	0.27
Benefit/Cost Ratio[1] with fuels treatments		0.03	0.03
Present Net Value[1] without fuels treatment		244,118	242,464
Present Net Value[1]	(100,000)	(3,027,493)	(2,930,076)
Jobs maintained or created[2]	0	139	136
Estimated Employee Income[3]	0	4,421,729	4,326,296

[1] Assumes 4% discount rate.

[2] Calculated using figures for the Deschutes National Forest from Appendix B-5 of the FY 1997 Timber Sale Program Annual Report. Excluding firewood from the volume harvested on the Deschutes National Forest, an estimated 9.6 jobs per million board feet were maintained or created.

[3] Derived by multiplying (a) the number of jobs maintained or created by (b) $31,811, the average 1999 salary in Central Oregon for lumber and wood products jobs. Source of salary information: Oregon Covered Employment & Payrolls by County and Industry, Oregon Employment Department, and US Bureau of Labor Statistics.

3.11.7 Environmental Justice

Data regarding minorities or people with disabilities employed in the region in the timber, mining, road construction, forestry services, and recreation sectors is unavailable. Some firms contracted by the Forest Service for reforestation work have traditionally hired Hispanic workers that comprise a migratory workforce in the area. Asian and Pacific Islanders uses of the area include commercial mushroom harvesting and developed camping associated with this activity. Some contracts are reserved for award to minority businesses under the USDA Office of Small and Disadvantaged Business Utilization and the Small Business Administration.

Direct and Indirect Effects – Environmental Justice – Alternative 1

All current uses of the National Forest System lands would continue, including recreation, harvesting of non-timber forest products, special-use permits, subsistence uses, and spiritual/aesthetic uses. Effects to minority populations, disabled persons, and low-income groups would not be disproportionate with other users of the National Forest System lands.

Direct and Indirect Effects – Environmental Justice – Alternative 2

These alternatives provide a variety of opportunities for potential contracts. Alternative 2 would have no impact on the contracting process or the USDA Small Business Administration program for reserving contracts for minority groups for tree planting, precommercial thinning, and road restoration. Employment and income would be available to all groups of people, subject to existing laws and regulations for set-asides, contract size, competition factors, skills and equipment, etc.

Set-asides for Small Business Administration Contracting opportunities would not be affected. Employment by firms that have hired Hispanic workers or other minority groups or low-income workers associated with reforestation or other potential contracting needs would not differ from those employed in the sectors as a whole. In the short-term (3-5 years), reforestation needs would potentially benefit this group. This alternative would plant about 76 acres.

There is no existing information on how much use the area receives from minority and low-income populations. Opportunities for all groups of people to collect species from disturbed and non-disturbed sites would be maintained by all alternatives, and no disproportionate effect is anticipated to subsets of the general population. None of the alternatives would have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes.

Direct and Indirect Effects – Environmental Justice – Alternative 3

Effects on Environmental Justice as a result of this project would be similar to those described in alternative 2.

3.11.8 Cumulative Effects

Cumulative effects for environmental justice and economic viability were analyzed at the county level. Deschutes County encompasses most of the local opportunity for sale and manufacturing of timber products. Activities listed in table 3.1 were analyzed to see if any of them would have an effect on environmental justice when added to activities proposed in the Flank project. At this scale there are currently no cumulative effects on environmental justice or economic viability as a result of pas

t, present and reasonably foreseeable future actions when added to the actions proposed in the Flank project.

3.12 Forest Plan Amendment

The evaluation of Alternatives 2 and 3 found that they would exceed the thermal cover levels for areas allocated to mule deer winter range or Management Area 7 Deer Habitat (MA 7), as described in the Deschutes National Forest Land and Resource Management Plan (LRMP). The need for this amendment is necessary to obtain the vegetative desired future conditions due to the area departing from a Historic Range of Variability (HRV). An amendment would be needed to implement Alternatives 2 and 3; objective #5 stated below would be amended for thermal cover.

3.12.1 LRMP Direction in MA 7 Deer Habitat

The following are the LRMP's goals and objectives for managing habitat within MA 7.

Goal : To manage vegetation to provide optimum habitat conditions on deer winter and transition ranges while providing some domestic livestock forage, wood products, visual quality and recreation opportunities (LRMP, page 4-113).

General Theme and Objectives:

- Vegetation would be managed to provide optimum habitat considering the inherent productivity of the land.
- Herbaceous vegetation would be managed to provide a vigorous forage base with a variety of forage species available.
- Forage conditions may be improved where conditions are poor.
- Foraging areas would be created where forage is lacking, maintained when in proper balance, or reduced when over abundant and more foraging areas are needed.
- Ideally, cover and forage areas should be in close proximity for optimum use by big game, with cover making up 40 percent of the land area. Approximately three-quarters of cover areas should be thermal cover with the remainder being hiding areas (LRMP, page 4-113).

LRMP Standards and Guidelines in MA 7 Deer Habitat

The following are standards and guidelines for managing deer habitat in MA 7. They are the most applicable with Objective 5 above, including the context for moving towards this objective.

Timber:

- Generally, programmed timber harvest is appropriate when required to regenerate new cover stands, maintain tree vigor for resistance to stand-threatening insect damage, or encourage desirable forage in deficient areas (M7-3).
- Even and uneven-aged management would be applied and may include precommercial and commercial thinning. Stocking levels would be based on site-specific conditions. A crown cover greater than 40 percent with trees 30 feet tall is recommended for thermal cover (also M7-13). Tree canopy-cover conditions for optimum thermal protection may need to be compromised somewhat in order to moderate the risk of future catastrophic pine beetle damage. Canopy cover should be managed at the highest percentage that would maintain healthy stand conditions with a low risk of catastrophic damage due to insects or disease. As a minimum, canopy cover must be 40 percent, but a greater canopy cover percentage is preferred (M7-5).

Wildlife:

- Habitat management would be designed to provide a mosaic of forested conditions which incorporates the concepts of escape and hiding cover, thermal cover, travel corridors, visual screens, and harassment potential (M7-10).
- The analysis area used for habitat management planning should be large enough so that meaningful habitat conditions can be determined. Normally this would be greater than 3,000 acres in size and may include other ownerships (M7-11).
- If foraging areas are created through timber harvesting, units would be designed to be irregularly shaped. Thermal cover would be maintained immediately adjacent to the foraging site. The stands providing cover can be in different age classes. The long-term situation would be an irregular mosaic of openings intermingled within tree stands. As an opening is reestablished with trees and qualifies as cover, adjacent areas may be harvested to maintain forage-producing areas where forage is deficient (M7-16).

3.12.2 LRMP Timing

- The LRMP has been in effect since 1990 and revision is scheduled to begin sometime in the future. Project implementation for Alternatives 2 and 3 are expected to occur during the second decade of the planning period (2010-2020).
- The timber harvest treatments under Alternatives 2 and 3 are expected to be implemented within the next 10 years.

3.12.3 Location and Size

There are 1,327 total acres (23%) of deer winter range (MA 7) in the project area, which is part of the adjoining 11,673-acre Tepee Draw Winter Range Habitat Unit (WRHU). WRHUs were developed in 2001 in cooperation with the Oregon Department of Fish and Wildlife (ODFW) in order to better assess habitat conditions for mule deer in relation with their home range size on winter range(s). The LRMP suggests a minimum habitat assessment area of 3,000 acres (M7-11). The Tepee Draw WRHU was used to assess hiding and thermal cover.

The table below shows the existing percentages and acres of hiding and thermal cover in the Tepee Draw WRHU, including the percentages for LRMP direction. Hiding cover is slightly above the desired condition, but well below in thermal cover. Field reconnaissance revealed that a large percentage of trees are experiencing bark beetle infestations that would further continue to spread and stress the remaining live trees. These cover requirements are unrealistic in low productivity ponderosa pine sites and are generally unattainable or sustainable, however growing stands at the upper 1/3 of site potential is realistic. In addition, it would be very difficult to quantify 30% of the area in thermal cover for the following reasons: 1) 5,576 acres or 48% of the land in the Tepee Draw WRHU is not suitable for timber production, 2) field reconnaissance of the area concluded that thermal cover is limited because it occurs in scattered patches of denser trees, which is primarily due to the low precipitation in the area; (Note: if the 5,576 acres of unsuitable land were subtracted from the WRHU total acres, the thermal cover percentage would be 32%).

Table 3.12.1 Existing Cover in Tepee Draw WRHU

	Percent cover & acres	LRMP direction
Hiding cover	14% (1,580 acres)	10%
Thermal cover	17% (1,948 acres)	30%

3.12.4 Goals, Objectives, and Outputs

Site productivity within MA 7 of the project area shows very few areas that can support a crown cover greater than 40 percent. The long-term goals would be to achieve levels of late old structure (LOS) similar to historic conditions and optimum thermal cover. The proposed amendment would allow achieving these long-term goal levels. In 15 years, some stands would have average diameters of 20" or greater. At this point, late old structure and thermal cover would begin to develop. The objective is to leave the largest, healthiest trees, therefore allowing large tree structure and healthy stands to eventually dominate similar to the historic stand structure composition (HRV).

The table below shows that both Alternatives 2 and 3 would slightly reduce hiding cover by 1% (31 acres) and meet LRMP direction, while thermal cover would be reduced by 3% (320 acres) in the Tepee Draw WRHU and continue to be below LRMP direction. As previously stated, thermal cover is marginal due to previous harvests and currently most stands are approximately 80 years old. In addition, the existing forested stands that provide thermal cover lack structural diversity, contain tree-stocking levels above the historic range of variability, and most stands are experiencing bark beetle attacks. By implementing Alternatives 2 or 3, it would decrease insect infestation and decrease the risk of a stand replacement fire. Another large fire within the broad general area may widely affect thermal cover for big game. LRMP M7-5 states the "tree canopy-cover conditions for optimum thermal protection may need to be compromised somewhat in order to moderate the risk of future catastrophic bark beetle damage. Cover should be managed at the highest percentage that would maintain healthy stand conditions with a low risk of catastrophic damage due to insects or disease."

By implementing either alternative and further reducing thermal cover, it may displace some deer to seek higher quality thermal during harsh winters. On the positive outcome, it would likely produce more browse in the short-term (<20 years) and quality thermal cover in the long-term (20+ years).

Table 3.12.2 Existing and Affected Cover in the Tepee Draw WRHU

	Existing percent cover & acres	Alternative 2 post-treatment percent & acres	Alternative 3 post-treatment percent & acres	LRMP direction
Hiding cover	14% (1,580 acres)	13% (1,549 acres)	13% (1,549 acres)	10%
Thermal cover	17% (1,948 acres)	14% (1,628 acres)	14% (1,628 acres)	30%

3.12.5 Management Prescription

This amendment applies only to this project area and alternatives, and would not apply to future decisions within the project area. This amendment does not alter the desired future conditions of the land or resources or the anticipated goods and services to be produced.

3.12.6 Significance

It is assumed that the proposed change in big game hiding cover would not significantly change the forest-wide impacts disclosed in the Deschutes National Forest Plan Environmental Impact Statement. FSM 1926.51 describes non-significant amendments as

1. Actions that do not significantly alter the multiple-use goals and objectives for long-term land and resource management;

2. Adjustments of management area boundaries or management prescriptions resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple-use goals and objectives for long-term land and resource management;
3. Minor changes in standards and guidelines; and/or
4. Opportunities for additional projects or activities that would contribute to achievement of the management prescriptions.

This amendment has been prepared under the 2000 rule as amended with transition wording at 36 CFR 219.35 that allows the use of the 1982 rule procedures. (See 65 FR 67568, Nov. 9, 2000, as amended at 66 FR 1865, Jan. 10, 2001; 66 FR 27554, May 17, 2001; 67 FR 35434, May 20, 2002; 68 FR 53297, Sept. 10, 2003; 69 FR 58057, Sept. 29, 2004). The 1982 planning rule and the 2000 rule as amended is available online at http://www.fs.fed.us/emc/nfma/2000_planning_rule.html.

Because this amendment does not significantly alter goals and objectives, is a minor change in a standard considering the size of the landscape, and provides an opportunity for contributing to achievement of the long-term goals and objectives, it meets the definition of a non-significant amendment.

3.13 Roadless and Potential Wilderness

There is no wilderness or inventoried roadless areas in or adjacent to the Flank planning area. None of the area meets the definitions of potential wilderness as described in FSH 1909.12 Chapter 70 Wilderness Evaluation. The nearest wilderness area (Three Sisters Wilderness) lies 30 miles to the northwest across the city of Bend and Highway 97. The nearest roadless area lies two miles to the southwest. This is the North Paulina Roadless area that wraps around Paulina Lake. The North Paulina Road (9710) wraps around the roadless area breaking up any contiguous blocks of unroaded ground that might be considered potential wilderness. The Flank planning area itself is heavily roaded. The largest parcel of the planning area that does not have system roads is the 429 acres of unit twelve. This unit is not a self-contained area. It does not have physical terrain that would allow natural conditions to be preserved.

3.14 Monitoring Plan

3.14.1 Vegetation

Post harvest monitoring would evaluate for reforestation needs. This would involve walking through units and putting in plots where needed to identify stocking levels to make sure they meet minimum requirements.

3.14.2 Fire and Fuels, Air Quality

Oregon Smoke Management Plan – This plan includes regional monitoring and regulation of pollutants less than 10 and 2.5 (PM10 and PM2.5) micrometers in size.

3.14.3 Range

Two condition and trend plots exist in the Flank planning area. Residual stubble height of Idaho Fescue is monitored in these plots as time and funding allows.

3.15 Consistency with Direction and Regulation

All proposed action alternatives would comply with the following directions and regulations:

- Deschutes National Forest Plan, including applicable Standards and Guidelines
- Eastside Screens Interim Direction
- The Record of Decision
- Clean Air Act
- Clean Water Act
- Endangered Species Act of 1973
- General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988).

Wildlife Compliance with Direction

Snags

Eastside Screens, 6. Interim Wildlife Standard, d. Scenario A, 4) a) Snags, Green Tree Replacements and Downed Logs: (1) "All sale activities…would maintain snags and green tree replacement trees of ≥ 21" dbh, (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100% potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures. NOTE: for Scenario A, the live remnant trees (≥ 21" dbh) left can be considered for part of the green replacement tree requirement."

Under alternative 2, snags would be removed. Snag densities are currently below direction within the surrounding watersheds, but within the stands in which salvage harvesting is proposed, snag levels are above the minimum required by the screens, and enough snags to meet these minimum standards would be maintained within those stands. Snag levels in lodgepole pine plant associations are currently well below direction, and areas in this plant association with sufficient snags are therefore especially important for snag dependent wildlife.

Under alternative 3, no snags are planned to be removed, and there would be no measurable short-term impacts to snags levels. In the long-term, snag levels would remain below forest standards for up to 30 years under alternatives 2 and 3.

Coarse Woody Material

WL-72 "…An average of at least 3 cull logs-per-acre, plus 3 additional logs-per-acre…would be retained after timber management activities. Minimum qualifying sizes are 10 inches in diameter at the small end and 15 feet long…"

WL-73 "Where logs…are not available, and average of 1 slash pile…or concentration…per acre would be retained to supplement qualifying logs."

The Screens (6. Interim wildlife standard; d. Scenario A, 4) Snags, Green Tree Replacements and Down Logs; [2]) revised these standards to read: " Pre-activity (currently existing) downed logs may be removed only when they exceed the quantities listed below…It is not the intention of this direction to leave standing trees for future logs in addition to the required snag numbers…" Quantities of logs: 3-6 pieces greater than 6 ft long and 12" in diameter or greater be maintained in ponderosa pine types (15-20 in mixed conifer), and 15-20 pieces greater than 8 feet long and 8" in diameter be maintained in lodgepole pine types. Fire prescription parameters would ensure that consumption would not exceed 3 inches total (1.5 inches per side) of diameter reduction in featured logs.

Develop prescribed burn prescriptions to minimize charring of logs (LRMP Standard WL-72).

Existing levels for percent cover appear to be meeting levels from DecAID (Table 3.3), but densities appear low as compared to the forest standards. Mitigation measures are proposed to help ensure that directed levels are met within proposed units.

Green Tree Replacements

Eastside Screens, 6. Interim Wildlife Standard, d. Scenario A, 4) a) Snags, Green Tree Replacements and Downed Logs: (1) "All sale activities…would maintain snags and green tree replacement trees of ≥ 21" dbh, (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100% potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures. NOTE: for Scenario A, the live remnant trees (≥ 21" dbh) left can be considered for part of the green replacement tree requirement."

The required number of GTR was calculated using Formula 2 of the Deschutes DWTL, and GTR levels after project implementation would meet or exceed the directed levels.

Late Old Structure

While there individual and small clusters of trees with old growth characteristics, there are no stands that meet the definition of LOS within the planning area (Hopkins 1992, and Hopkins et al. 1992). The individual trees with old growth characteristics are in densities of less than 12 per acre, and in stands smaller than 10 acres. There are no Old-Growth Management Areas (OGMAs) within the boundaries of the proposed project area. This project complies with Eastside Screens, 6. Interim wildlife standard, d. Scenario A parts (a) and (b).

Special or Unique Habitats

The forest plan stipulates that habitat for species associated with springs, seeps, cliffs, and talus slopes would be protected during project development. There are a few rock outcroppings, some forested lavas, one sagebrush-dominated slope, and two human-made guzzlers within the project area. Project Design Criteria (PDCs) listed in chapter 2 specify protection measures for these sites.

Summer Range

The LRMP requirement is to provide 30% hiding cover in non-black bark summer range in each IU. IU 47 is currently at 56.6% (6,828 acres) and IU 50 is at 22.5% (3,755 acres). The effect of Alternative 2 or 3 in IU 47 is 22 acres, so it would change the IU to 56.4%. The effect of Alternative 2 or 3 in IU 50 is 9 acres, so it would change the IU to 22.4%. This very minor change would not necessitate an amendment of the LRMP. The LRMP requirement to retain 10% of treated stands in clumps and narrow strips of retention areas along roads would also be met.

Winter Range

There is no LRMP standard or guideline that is applicable to elk (i.e. no designated Key Elk Area).

The LRMP standards and guidelines that are applicable to Deer Habitat (winter range) within the project area are M7-5, M7-6, M7-10, M7-11, M7-13, M7-14, M7-15, and M7-16. They have been discussed in the big game section and all these would be met (except M7-5) through either project mitigation and/or built into the project design. A non-significant forest plan amendment was prepared to address M7-5. In addition, this standard and guideline also allows thermal cover to be compromised and may be needed in order to moderate the risk of catastrophic damage due to insects and disease.

Open Roads & Motorized Trails

The following LRMP standards and guidelines are applicable to the Flank EA: WL-53, TS-11 thru TS-14, and M7-22, pertaining to target road density of 2.5 p/sq mi in summer range and 1.5 p/sq mi in winter range. Alternative 2 would not meet or move towards target road density in summer range in IU 47 or 50, nor within the Tepee Draw WRHU. Alternative 3 would also not meet, but would be moving toward the desired conditions in the respective IUs and WRHU. LRMP TS-13 states that if a preferred project

alternative would exceed guidelines, a detailed further evaluation by a wildlife biologist would be required. This evaluation would include the biologist's professional judgment on the effects of the proposed project. If the evaluation concludes there is a net benefit, the project would be considered compatible with LRMP direction.

By applying the project design criteria and mitigation measures as described in the above sections, and considering seasonal road closures through the Green Dot System and Opine Travel Management Area, there would be a net benefit by slightly increasing habitat effectiveness in summer and winter range, a net benefit by increasing forage (grasses and forbs), and providing better quality browse through prescribed burning, and a net benefit of decreasing the risk of a catastrophic fire. In conclusion, the evaluation clearly shows that Alternative 3 would be compatible with LRMP roads standards and guidelines.

East Side Screens -- The most applicable standards and guidelines in relationship with the Flank EA would be Interim wildlife standard 6d Scenario A, 3a (1-4). These would be met through Alternative 2 or 3 because medium diameter or all remnant late and old seral live trees greater than 21 inches would be maintained within the top one-third of site potential in proposed harvest units, the two OGMA stands outside of the project area would connect, and a corridor of at least 400 feet wide would be provided.

Northern Goshawk

LRMP direction states: WL-6 "Nesting habitat for at least 40 goshawk pairs would be provided in mixed conifer, mountain hemlock, and Ponderosa pine forests outside of Wilderness and the Oregon Cascades Recreation Area
…Habitat for an additional 30 pairs in lodgepole pine forest…" This is for the whole forest.
WL-9 "Nest sites would be selected on the basis of present or past use whenever possible…"
The Eastside Screens provide additional direction for goshawk habitat management on the Deschutes National Forest. In summary it states that all active and historic goshawk nest would be protected from disturbance, with a 30 acre no harvest buffer around the nest tree and designation of a 400 acre post-fledging area that would retain LOS stands and enhance younger stands to become LOS (Interim wildlife standard Scenario A, (5) Goshawks, a-c pages 12-13). A historic nest site is defined as one that has had nesting activity within the prior 5 years of the date of the Screens (1994/1995, page 13). Based on this definition, there is one known nest site within the proposed project area. This nest and any additional, active goshawk nests that are found before or during management activities would be protected from disturbance during the nesting season (March 1 – August 31) as required by Forest Plan WL-3. There are mitigation measures in place to address any new nesting activity discovered during project implementation.

Based on the assumption that 430 acres provide a nest core and post-fledging area, and that foraging habitat is not limiting, there would be no reduction in habitat after completion of either of the proposed alternatives. All known goshawk nest sites would be retained under both alternatives. Mitigation measures have been proposed to reduce indirect impacts within the post-fledging area. Current Screens direction, WL-7 and WL-9 are met; WL-6 is likely met.

Cooper's Hawk and Sharp-shinned Hawk

WL-13 "Nesting habitat for at least 60 pairs of Cooper's hawk would be provided in mixed conifer and ponderosa pine forests outside of wilderness and the Oregon Cascades Recreation Area."
WL-16, 26 "Prospective sites with appropriate vegetative structure …would be identified before they have been precommercially thinned.
WL-21 "Nesting habitat for at least 60 pairs of sharp-shinned hawk would be provided…"
WL-28 "Active nest sites should be protected from disturbing activities within ¼ mile…by restricting operations…April 15-August 31.
All alternatives comply with current direction, and it is likely that WL-13 and WL-16 are being met. Potential nesting habitat would remain within the project area, and potential habitat is not considered

limiting on the forest. Any new nests discovered would be protected from disturbance (see Mitigation Measures).

Red-tailed Hawk

WL-2 “Active nest sites would be protected by maintaining the forest character of an area at least 300 feet in radius around the nest….”
WL-3 “Active nest sites should be protected from disturbing activities within ¼ mile …March 1 –August 31…”
There are no known nests within the project area. Mitigation measures are in place to protect any new nests found from project disturbances. Current direction is met under all alternatives.

Woodpeckers

WL-37 “In coniferous forest, sufficient snags would be maintained to provide 40 percent of potential levels of cavity nesting species within even-aged harvest units of the General Forest, visual areas…, and Deer Management Allocations. In uneven-aged harvest units, within the management areas noted above, live replacement trees would be left during any harvest to assure the 60 percent of cavity nesting potential through the rotation, except where natural deficits occur in diameter classes. In both even and uneven-aged management, groupings of green replacements would be the preferred implementation technique. Compliance would be based on harvest unit area rather than an individual acre evaluation.”

WL-38 “Specific guidance would be provided by the Deschutes National Forest Wildlife Tree Implementation Plan.”

Snag levels within the proposed project area are below the levels directed by the Forest Plan and Eastside Screens. Under alternative 2, salvage harvesting is proposed. Levels within units salvage logged would be left high enough to meet current direction on those units, but on average the levels within the watershed are below direction and would therefore be further reduced. Under alternative 3, no salvage logging would occur. Because no snags are planned to be removed under this alternative, there would be no measurable direct impacts to snags levels. Snag levels are below directed levels, however direction would be met in that current levels would be maintained.

Eastside Screens, 6. Interim Wildlife Standard, d. Scenario A, 4) a) Snags, Green Tree Replacements and Downed Logs: (1) “All sale activities…would maintain snags and green tree replacement trees of $\geq$ 21” dbh, (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100% potential population levels of primary cavity excavators.

No snags or trees greater than 21” dbh would be removed under either alternative except where considered a safety hazard, and GTR levels would be maintained at or above directed levels. This direction would be met under both action alternatives.

SOC, BCC, and Landbirds

There is no specific direction for these species within the LRMP or Screens. Habitat provisions for many of the MIS species also provides habitat for various landbirds and meets the intent of the Conservation Strategy and subsequently, the Executive Order. No intentional take of migratory birds is expected to occur as result of the project.

Bats

Specific direction in the LRMP is for Townsend's big-eared bats and is discussed in the Biological Evaluation for this project. Other relevant directions includes direction for snags, and, as discussed in the section on snags, CWM, and GTRs, are being met by all alternatives.

Other applicable Standards and Guidelines and/or Best Management Practices may exist which were not directly referenced in this document. Their exclusion does not indicate that they were overlooked or are inapplicable. As project development proceeds, appropriate constraints or mitigations may be added or changed in order to better meet the intent of adequate resource protection or enhancement as directed in the 1990 Deschutes National Forest Land and Resource Management Plan and Final Environmental Impact Statement.

3.16 Other Disclosures

Irretrievable Irrevocable Commitment of Resources

None of the specialists consulted for this project anticipated any commitment of irretrievable or irrevocable resources.

Fisheries & Hydrology Resources

The Flank Project lies within the Upper Dry River 10th field watershed, and is within lands managed under the 1995 Inland Native Fish Strategy, which amended the 1990 Deschutes National Forest Land and Resource Management Plan. The project area has no intermittent or perennial streams, riparian areas, or wetlands. There are no Riparian Habitat Conservation Areas. The nearest surface water resource is East Lake within Newberry Crater approximately 4 miles southwest of the project area boundary. The nearest stream is over 10 miles distant. There would be no effects to water resources, fisheries, riparian areas, floodplains, or wetlands from implementing No Action or any action alternative. The project would be consistent with the Clean Water Act as there would be no effects to Oregon Department of Environmental Quality 303(d) listed water bodies. There would be no effects to Essential Fish Habitat.

Long Term Climate Change

This proposed action would affect 5615 acres of forest by commercially thinning smaller trees from the stand, retaining a residual stand of about 30-60 percent of the original stand basal area. This scope and degree of change would be minor relative to the amount of forested land being treated in the 480,640 acres covered by the two watersheds included in the project area. A project of this magnitude would have such minimal contributions of greenhouse gasses that its impact on global climate change would be infinitesimal. Therefore, at the global scale, the proposed action's direct and indirect contribution to greenhouse gasses and climate change would be negligible.
In addition, because the direct and indirect effects would be negligible, the proposed action's contribution to cumulative effects on greenhouse gasses and climate change would also be negligible.

The Intergovernmental Panel on Climate Change has summarized the contributions to climate change of global human activity sectors in its Fourth Assessment Report (IPCC 2007). The top three anthropogenic (human-caused) contributors to greenhouse gas emissions (from 1970-2004) are: fossil

fuel combustion (56.6% of global total), deforestation (17.3%), and agriculture/waste/energy (14.3%). IPCC subdivides the deforestation category into land use conversions, and large scale deforestation. Deforestation is defined as removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed landscapes (IPCC 2000).

This vegetation management project does not include deforestation and therefore does not fall within any of these main contributors of greenhouse gas emissions. Forested land would not be converted into a developed or agricultural condition. In fact, forest stands are being retained and thinned to maintain a vigorous forested condition that can continue to support trees and sequester carbon long-term.

This project is also consistent with IPCC recommendations for land use to help mitigate climate change. The 2007 IPCC report summarizes sector-specific key mitigation "technologies". For the forestry sector, the report recommends forest management including management to "improve tree species" and increase biomass. The proposed action is consistent with these recommendations because it improves the drought tolerant trees species by focusing on retaining ponderosa pine and removing lodgepole pine. Biomass production is improved by reducing the risk of large-scale tree mortality to wildfire and bark beetles through promoting growth and leaving the healthiest dominant and codominant trees.

Timber management projects can influence carbon dioxide sequestration in three main ways: (1) by increasing new forests (afforestation), (2) by avoiding their damage or destruction (avoided deforestation), and (3) by manipulating existing forest cover (managed forests). Land-use changes, specifically deforestation and regrowth, are by far the biggest factors on a global scale in forests' role as sources or sinks of carbon dioxide, respectively (IPCC, Intergovernmental Panel on Climate Change, 2000). Projects that create forests or improve forest conditions and capacity to grow trees are positive factors in carbon sequestration. The proposed action falls into this category.

Chapter 4. Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State and local agencies, tribes and non-forest service persons during the development of this environmental assessment:

4.1 Interdisciplinary Team Members

Ben Hernandez
Position: Wildlife Biologist
Education : BS Range & Wildlife Management
Experience: 8 years
Contribution: Big Game Section

Beth Peer
Position: Bend/Ft Rock RD, Environmental Coordinator
Education : BS Anthropology, University of Oregon (1990)
Experience: 18 years professional experience
Contribution: NEPA oversight

Char Powers
Position: Bend/Ft Rock RD, Botanist/Ecologist
Education : B.S. The Evergreen State College (1984)
Experience: 21 years professional experience
Contribution: Botany and Invasive Plants Analysis

Christy McDevitt
Position: Writer/Editor and Supervisory Presale Forester
Education : B.S. Forest Management University of Washington
Experience: 5 years professional experience
Contribution: Writer & Editor

Elizabeth Johnson
Position: Bend/Ft Rock Wildlife Biologist
Education : BA Anthropology, Cornell University (1995), MS Wildlife Ecology Utah State Univ. (2005)
Experience: 6 months professional experience
Contribution: Wildlife Biology Analysis

Janine McFarland
Position: Bend/Ft Rock RD Archeologist, District Program Lead
Education : BA, Anthropology, Oregon State University (1984); MA Interdisciplinary Studies (Anthropology, History, Geography), Oregon State University (1989)
Experience: 24 years professional experience
Contribution: Heritage Project Input for Cultural Resources

Jason Fisher
Position: Range Technician
Education : BS Environmental Science, Bowling Green State University (1996)
Experience: 6 months professional experience
Contribution: Range Analysis

Jim Lowrie
Position: Bend/Ft. Rock RD, Wildlife Biologist, Interdisciplinary Team Leader
Education : BS Wildlife Science, Oregon State University (1975)

Experience: 31 years professional experience
Contribution: Interdisciplinary Team Leader, Wildlife Biology Analysis Oversight

Pete Powers
Position: Bend/Ft Rock Silvicultural Forester
Education : BS Forestry, Washington State University (1979)
Experience: 22 years professional experience
Contribution: Vegetation Analysis

Peter Sussmann
Position: Soil Scientist
Education : BS University of Illinois (1986)
Experience: 18 years professional experience
Contribution: Soils analysis

Steve Bigby
Position: Bend/Ft. Rock RD, District Roads Manager
Education : Oregon Institute of Technology
Experience: 20 years professional experience
Contribution: Roads Analysis

Steve Burns
Position: Fuels Planner
Education : BS Forest Land Management, University of Montana (1987)
Experience: 9 years professional experience
Contribution: Fire & Fuels Analysis

Vicki Ramming
Position: Central Oregon OHV Program Manager
Experience: 32 years professional experience
Contribution: Recreation Analysis

4.2 Tribes

Government to government consultation regarding this project was conducted with the Confederated Tribes of the Warm Springs, Burns Paiute Tribe, and the Klamath Tribes on July 22, 2009. No comments were received from the tribes.

4.3 Elected Officials

Senator Jeff Merkley,
Mr Joe Stutler, Deschutes County

4.4 Individuals and Organizations

Comments were received from the following organizations, Cascadia Wildlands, Deschutes County, Department of Fish and Wildlife, Oregon Wild, and Oregon Chapter Sierra Club. Two individuals, Keith and Janet Nash and Gordon Baker submitted comments.

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Appendix A: Issue Disposition

Comments/Potential issues may be: An issue is a point of disagreement with effects related to the proposed action, cause/effect

- Resolved by Forest Plan Management Area
- Addressed through implementation of Forest Plan S&Gs and BMPs
  regulation
- Addressed through implementation of project-specific mitigation measures or PDCs
- Addressed during processes or analyses routinely conducted by ID Team
- Addressed through spatial location of activities during alternative design
- Used to drive or partially drive an alternative, or
- Beyond the scope of the project

* Beyond the Scope
* Already decided by law, policy or

* Irrelevant to the decision to be made
* Conjectural in nature, not supported

Issue Statement	***General Resolution***	***Key Indicators or Measures***	***Design Features/ Mitigations/ Monitoring***	***General Analysis Strategy***	***Assignment Status***	***Letter #***
We are concerned, however, with the proposed salvage logging and overstory removal	**Analyze under alternative 3**	Acres of HSH and HOR	NA	Remove HOR, HSH from this alternative	Team	***#1***
1A We would also encourage you to use fire wheter actively or passively as	**Part of proposed action**	Acres burned	NA	Analysis issue, tracked through the document	Steve Burns	***#1***

Issue Statement	General Resolution	Key Indicators or Measures	Design Features/ Mitigations/ Monitoring	General Analysis Strategy	Assignment Status	Letter #
much as possible to achieve management goals						
3a. Closure of roads along fence lines would make fence maintenance harder	**Already decided by policy, part of proposed action**	Miles road closed	NA	Range person would be tracking this and these concerns would be analyzed in the document., check for administrative access by permittes (grazing)	Jason Fischer	# 3
3b. OHV trails next to fences makes maintenance dangerous	**Outside the scope**	NA	NA	No change to the OHV system is proposed as part of this project	Vicki Ramming	# 3
3c. Watersets	**Incorporate into proposed action**	Avoid watersets with PDC	Avoid using watersets for landings	Locate watersets, avoid with operaitons, or return areas to previous condition after operations	Jason Fishcer	# 3
3d. Fence building with KV funds	**Already decided by law, outside scope**	NA	NA	Can't build fence with KV funds	NA	# 3

Issue Statement	General Resolution	Key Indicators or Measures	Design Features/ Mitigations/ Monitoring	General Analysis Strategy	Assignment Status	Letter #
3f. Previous timber sale did not return the road to post-haul conditions	**Outside the scope**	NA	Existing road conditions shall be analyzed as part of the engineerng section and road work planned accordingly. Road conditions should meet contract specs. After harvest is complete, TSA	Roads analysis should provide for adequate road conditons The commercial user is responsible for all required road maintenance during the period of commercial use.	Steve Bigby	# 3
3g. boiled down to economics-the contractors would have to pay to use the 23/25 Road, which is hard surfaced and better designed to support this level of traffic. The 18 Road would also be a better route	**Already decided by policy**	NA	Roads would be maintained to the condition needed for log haul and returned to the maintenance level for which they are designed post sale	Timber sale and road analysis would be completed for each unit, identifying transportation routes for haul.	Steve Bigby	# 3
4a. Road densities should be reduced to the LRMP required levels	**Alreddy decided by law**	Miles road/squa re mile	Target levels are specified in Deschutes Forest Plan	We are to work toward the target level. Guideline densities would be used as a threshold and would not serve as the basis for assessing confomrance with the Forest Plan (provide a line officer with a	Beth Johnson Ben Hernandez Steve Bigby	#4

Issue Statement	General Resolution	Key Indicators or Measures	Design Features/ Mitigations/ Monitoring	General Analysis Strategy	Assignment Status	Letter #
				recommendation as to how far to go toward this target density. Conduct a road density analysis.		
4b. Recommend 5 acre holes on 10% of the stands to provide for future forage and to break of homogenaetiy	**Incorporate into Alternative 3**	Concnetration of gaps as a percentage of the stand.	NOTE: Under six acres size no need to monitor fo reforestation.	Holes would be achieved through Rxs to remove PICO in stands. Analysis of this would not be different from the proposed action for most folks, current condition already provides some of this variety. We'll be analyzing this	Team	*#4*
5A. HOR would redcue avg DBH and cause stands to move away from OG characteristics	**Conjectural in nature, Could be excluded or Rx changed and part of alt 3?**	DBH of remaining PIPO, PICO stands	PIPO stands: HOR=removal of PICO in PIPO stands. Thus allowing remaining PIPO to grow larger. Not reducing avg DBH of target species PICO stands: Without a stand replacement fire, we are trying to get to older, healthy PICO. Removal of the overstory would allwo the understory PICO to grow. Mistletoe would not be elmiinted from system, would remain in retention patches. Rx is not to eradicate mistletoe . Normal cycle of		Pete Powers	#5

Issue Statement	*General Resolution*	*Key Indicators or Measures*	*Design Features/ Mitigations/ Monitoring*	*General Analysis Strategy*	*Assignment Status*	*Letter #*
5B. The agency should develop an explicit plan to leave certain landscape patches untreated for long periods so that large snags can be recruited at near natural levels in those areas. Please run a stand simulation model to help determine what fraction of the landscape to treat and what fraction to leave untreated.	**Already decided by policy**	GTR Snag retention measures	GTR retention	Leaving things untreated… not growing large trees… by not growing large trees… not getting large snags. Entire project area has the potential to burn in one fire if not treated[1] **Snag log transects would be conducted to determine exisiting**	Pete Powers Steve Burns Beth Johnson Ben Hernandez	*#5*
5c. Uninventoried roadless areas	**Outside the scope**	NA	NA	Brief statement in EA, no IRA	Christy McDevitt	*#5*
5d. goshawks are most closely associated with dense forests and there is no evidence(as often asserted by the USFS) that goashawks benefit from inc	**Include in PA, conjecutral in nature, Alt 3 to include gosshawk management**	Qualitiati ve descriptio n fo gosshawk protection	Gosshawk design criteria…TBD	Include core area to protect gosshaw nest, consider recent study (as per Sean) detailing benefits to gosshawk as a result of thinning?	Beth Johonson, Ben Hernandez	*#6*

[1] 18 fire 3800 acres, Woodside fire 1900, Evans west 4200, Paulina 12,600, Skeleton 18,000 acres all stand replacement fires, Most of these fires happened in <90% weather

Issue Statement	General Resolution	Key Indicators or Measures	Design Features/ Mitigations/ Monitoring	General Analysis Strategy	Assignment Status	Letter #
rm to fly		measures				
5e. Consider reducing or eliminating livestock as part of the corrective action.	**Outside the scope**	NA	NA	NA		*#5*
5f. Don't design and implement this project as part of a continuing effort to suppress and control fire. This should be part of an overall effort to reintroduce and restore fire regimes.	**Included in the proposed action**	Acres treated for fuel reduction	NA	Included in proposed action	Steve Burns	*#5*
5g. Consider also the historic abundance of ecological attributes like large trees, large snags, roadless areas, etc. all of which have been severely reduced from historic norms. Also, consider the	**Alrady decided by law**	NA	Needs for large trees and snags are described by the Forest Plan	Use forest plan direction to guide design criteria for large trees, snags. Use eastside screens, consider HRV as described in that guidance.	Team	*#5*

Issue Statement	General Resolution	Key Indicators or Measures	Design Features/ Mitigations/ Monitoring	General Analysis Strategy	Assignment Status	Letter #
natural range of variability, which is the historic range of variability as modified by future climate change.						
5h. The goal should not be a uniform low severity fire regime, but rather a wide mix of tree densities in patches of varying sizes	**Conjectural in nature**	Fire regieme distributio n across the planning area. (map in fire section)	NA	10% retention would = mixed severity, some areas not treated with existing burn plan.	Steve Burns	*#5*
5i. Treatments in mixed severity fire regimes should be more patchy and leave behind more structure, more snags and large dead wood.	**Already decided by law, policy, direction**	qualitative	PDCs	Historic fire regieme of the area would dictate the target fire regieme post treatment. Conditions for mixed severity fire regiemes must meet forest plan standards and guidelines for fuel loading as well as retain large decadent structures	Steve Burns	*#5*
5j. Identify and retain all trees with old-growth characteristics even if they are less than 21" dbh.	**Already decided by law, policy, direction**	Plate size, crown strucutre, knots, branches below	PDC, more fire resistent trees would be selected in the Rxs.	Align with research by Van Pelt 2008	Pete Powers	*#5*

Issue Statement	*General Resolution*	*Key Indicators or Measures*	*Design Features/ Mitigations/ Monitoring*	*General Analysis Strategy*	*Assignment Status*	*Letter #*
		main crown (see section 1.8.1)				

Appendix B: Post Sale Improvement Opportunities

Subsoil

About 24 acres of the soil resource within proposed activity areas listed in Table 3.3 (Unit #s 12, 14, 16, 20, 21, 23, 32, 33, 35, 36, 39, 47, 50, 53, 56, 59, 67 and 70) are likely to need subsoiling restoration treatments of previous impacts as a Sale Area Improvement in order to meet LRMP standards for soil productivity. These activities would be funded with KV monies or other sources, as available, as a mandatory part of the proposed actions associated with alternatives 2 & 3. Subsoiling treatments on skid trails and log landings additional to these acres in any units receiving mechanical harvest treatments would further reduce the cumulative amount of detrimentally compacted soil and result in a net improvement in soil quality over a larger portion of the project area. The cost of this activity would range from 4800 dollars to 7200 dollars depending on whether the work was done by the USFS or a contractor.

Precommercial Thinning

Acres: 2445, $136 per acre for forest crews or $240 per acre for KV funding.

Precommercial thinning is used in two different situations. One is in regeneration stands which are now stocked with saplings. The second situation is in stands where there is an overstory and an understory which competes with the overstory, acts as ladder fuels and stocks openings in the overstory crown cover. Precommercial thinning in the Flank area would be used in both these situations. Within plantations which were planted or naturally seeded in two to three decades ago the stocking of the trees is at a level where there is inter-tree competition which is causing reduced growth and self pruning of lower branches. These stands also would not likely survive a light underburn or wild fire due to the tree densities and arrangement of other fuels including brush. Thinning in these stands would leave trees on 16 to 25 foot spacing in order to increase growth and followed with fuels treatments increase the chance of surviving fires.

In the Flank project precommercial thinning would also be used to manage the understory in stands which have multi canopy characteristics. This thinning leaving the biggest tree which is not in competition or acting as ladder fuels into the crown would be left on 20 to 30 foot spacing. Where underburning is planned burning may occur before the thinning to reduce the chance of killing desired trees which were left. Instead trees not killed by underburning would be thinned thus leaving the areas needing a few trees stocked.

Appendix C: Previous Activity and Existing Soil Compaction by Unit

Unit	acres	Flank Rx	Railroad Logging (Yes/No) _Percent	Temp Road (acres)	FACTS Activity (% 0verlap)	Existing Detrimental Condition (percent)
1	13	HTH	Y_50			5
2	42	HTH	Y_75			5
3	23	HTH	Y_50			5
4	31	HTH	Y_100		4	5
5	53		Y_75	0.86		5
6	35	HTH	Y_100			5
7	102	HTH	Y_90	1.26		5
8	57	HTH	Y_75			5
9	128	HTH	Y_60_40	1.29	3	5
10	22	HTH	Y_100		8	5
11	46	HTH	Y_100	0.71		5
12	429	HTH	Y_100		95	20
13	51	HTH	Y_100	0.74	3	5
14	73	HOR	Y_100		98	20
15	35	HTH	Y_100		8	5
16	233	HTH	Y_100	0.42	91	20
17	20	HTH	Y_100		24	5
18	36	HTH	Y_100		5	5
19	17	HTH	Y_90			5
20	85	HTH	Y_100	0.27	98	5
21	47	HTH	Y_100	0.51	97	16
22	56	y 60 BA & gaps	Y_80	0.67		5
23	88	HTH	Y_100	0.24	95	19
24	22	HTH	Y_100		14	5
25	53	HTH	Y_90		2	5
26	50	HTH	Y_80	0.43	4	5
27	87	HTH	Y_90	1.07		5
28	29	HTH	Y_90			5
29	10	HTH	Y_100			5
30	16	HOR	Y_100			5
31	81		Y_90			5
32	25	y 25- 30 BA	Y_100		74	20
33	53	y 25- 30 BA	Y_90	0.42	98	20

Unit	acres	Flank Rx	Railroad Logging (Yes/No) _Percent	Temp Road (acres)	FACTS Activity (% 0verlap)	Existing Detrimental Condition (percent)
34	9	y Ret PICO	Y_75	0.29		5
35	25	y 60 BA & gaps	Y_50_50		90	20
36	20	y Ret PICO	Y_100		96	20
37	12	HTH	Y_40_40			5
38	178	HTH	Y_75_25	1.25	69	5
39	281	HTH	Y_100	1.09	99	20
40	27	HTH	Y_70	0.47		5
41	34	HTH	Y_70	0.59		5
42	35	HTH	Y_70			5
43	34		Y_70	0.38		5
44	134	HTH	Y_90		9	5
45	47		Y_90			5
46	15	HTH	Y_80			5
47	23	HOR	Y_60_40		96	15
48	10	HTH	Y_20_40			5
49	20	HTH	Y_0_100	1.60		10
50	68	HTH	Y_80_10	0.42	86	5
51	56	HTH	Y_70_15		13	5
52	38	HTH	Y_90		44	5
53	41	HOR	Y_80		97	20
54	73		Y_100		3	5
55	68	y 60 BA & gaps	Y_35_65	1.82	77	5
56	86	HTH	Y_100	0.35	98	15
57	36	HTH	Y_75			5
58	41	HTH	Y_100		3	5
59	152	HTH	Y_100		97	15
60	23	HTH	Y_90			5
61	272	HTH	Y_100	0.95	81	5
62	26	HTH	Y_50			5
63	48	HTH	Y_80			5
64	123	HTH	Y_90	0.4		5
65	81	HTH	Y_90	1.0		5
66	305	HTH	Y_85_15	0.87		5
67	71	HTH	Y_100		99	18
68	118	HTH	Y_10_90			10
69	62	HTH	Y_50_50		3	10
70	66	HTH	Y_60_40		93	20

Unit	acres	Flank Rx	Railroad Logging (Yes/No) _Percent	Temp Road (acres)	FACTS Activity (% 0verlap)	Existing Detrimental Condition (percent)
71	20	HTH	Y_60			5
72	18	HTH	Y_10_70			5
73	149	HTH	Y_100	0.69		10
74	102	HTH	Y_80			5
75	13		Y_80		96	16
76	9		Y_90		97	20
77	164	HTH	Y_90	1.21		5
78	5		Y_70		94	20
79	12		Y_80		91	15
80	62	HTH	Y_80	0.36	91	15
81	19	HOR	Y_90		100	20
82	18		Check photo			
83	42	y Ret PICO	Y_90		3	5
84	15	HOR	Y_10			5
85	19	HTH	Y_70			5
86	48	HTH	Y_60	1.76		5
87	28	HTH	Y_0_100			10
88	39	HOR	Y_30_70		82	15